THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXIV. No. 2114.] LONDON, NOVEMBER 17, 1903. [55TH YEAR. PRICE 6d.

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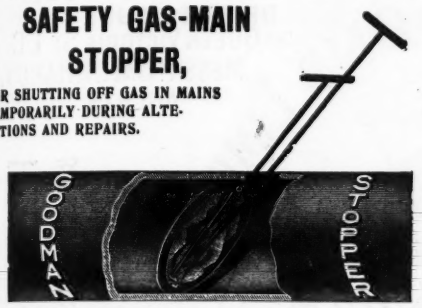

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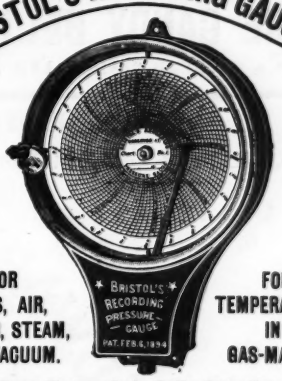

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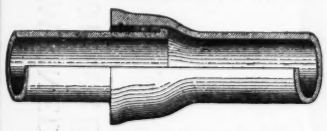

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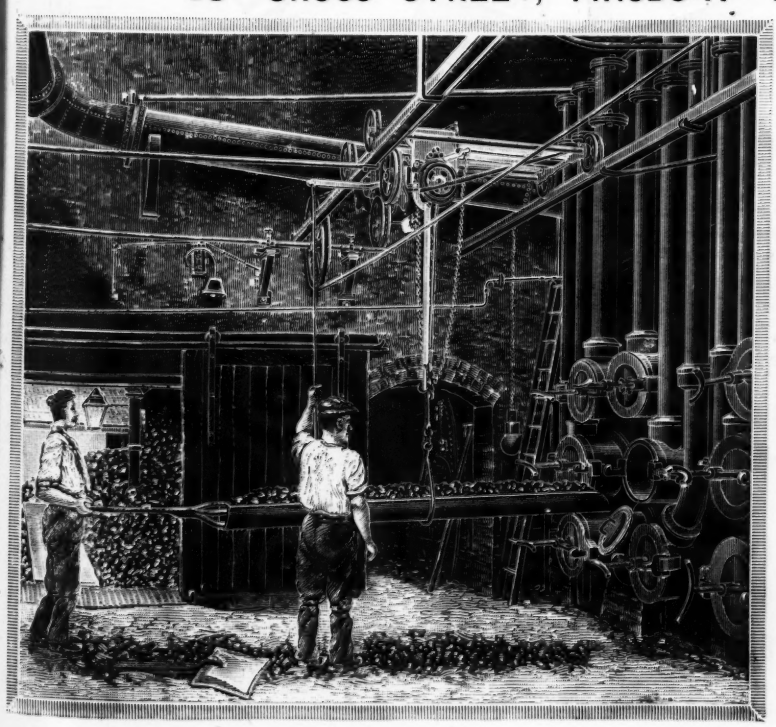

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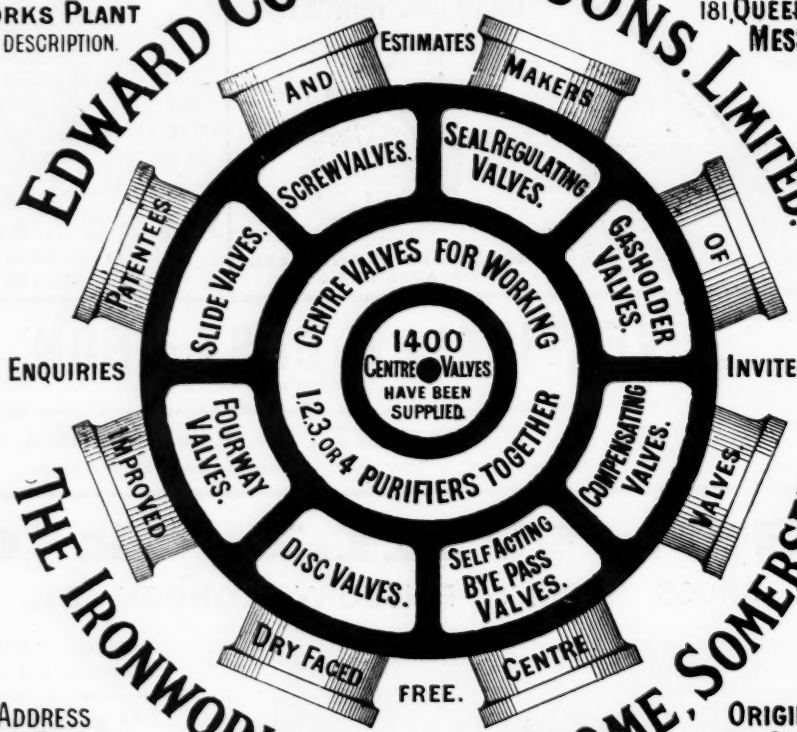

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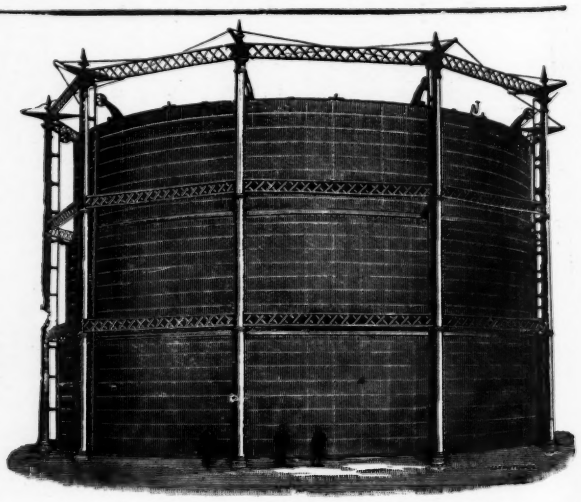

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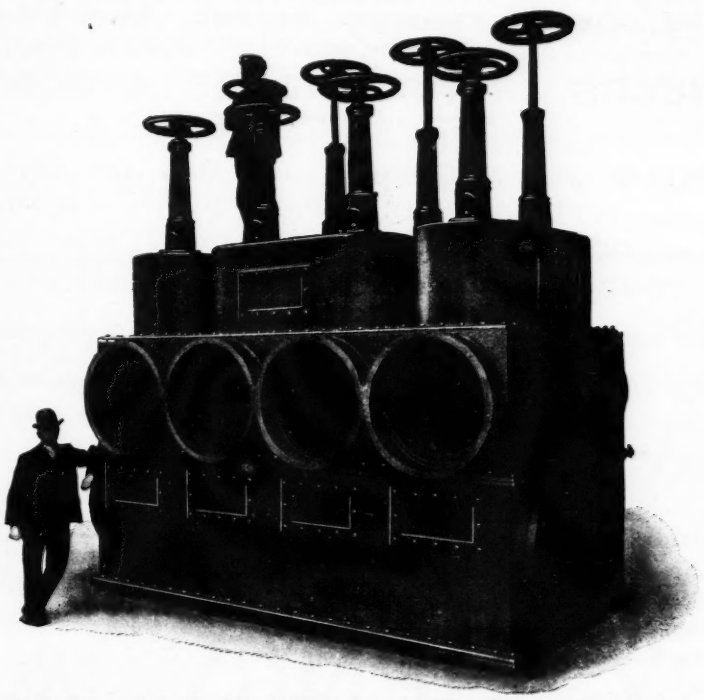

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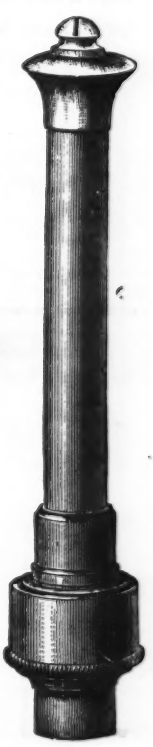

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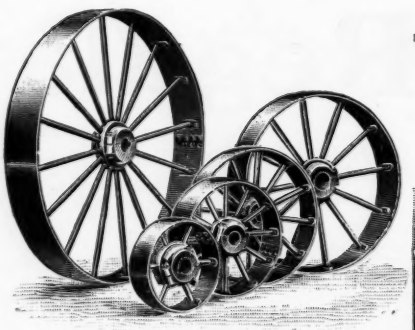

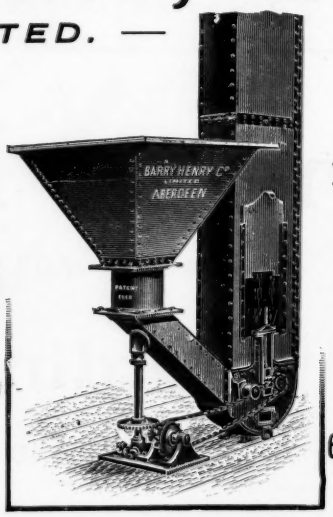

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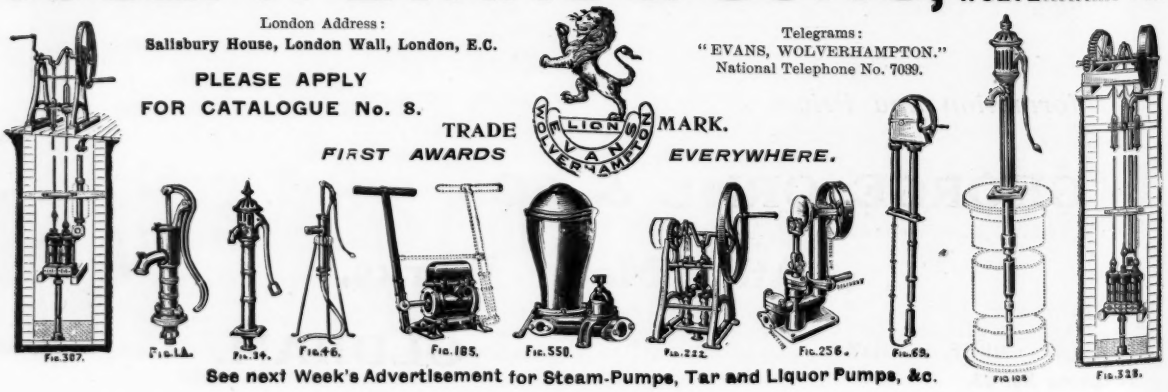

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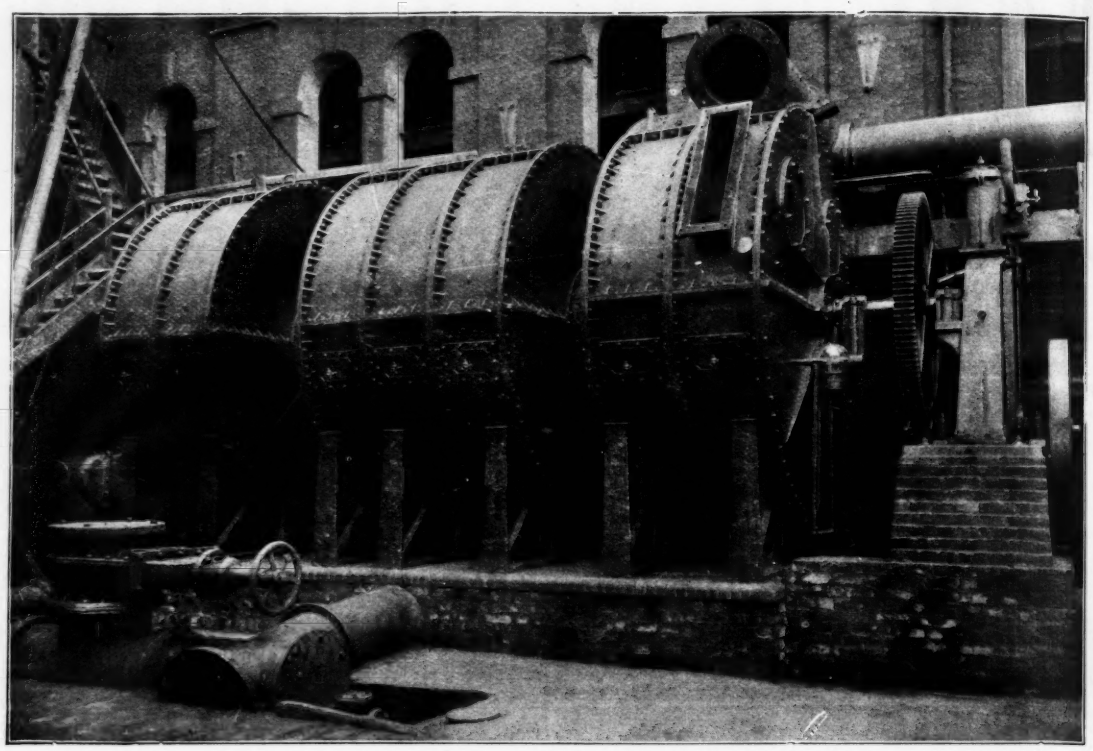

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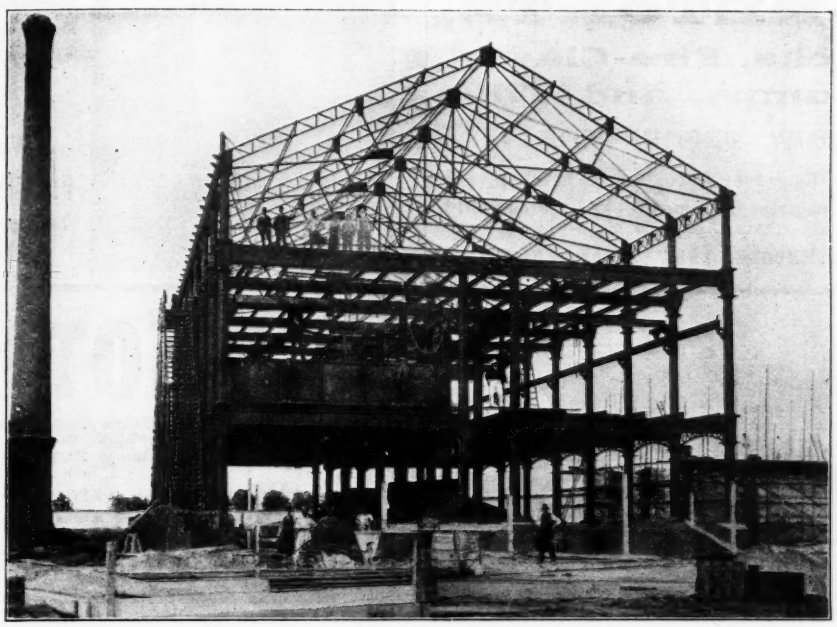

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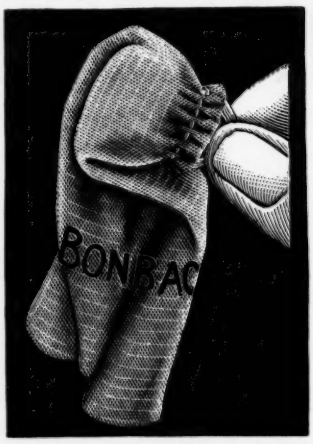

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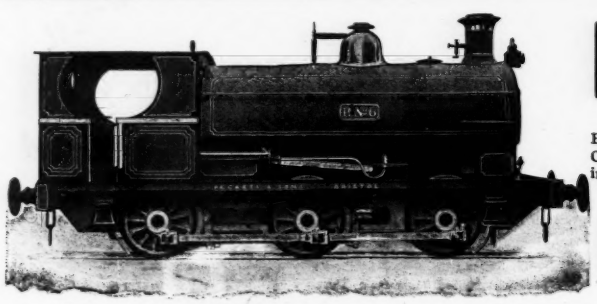

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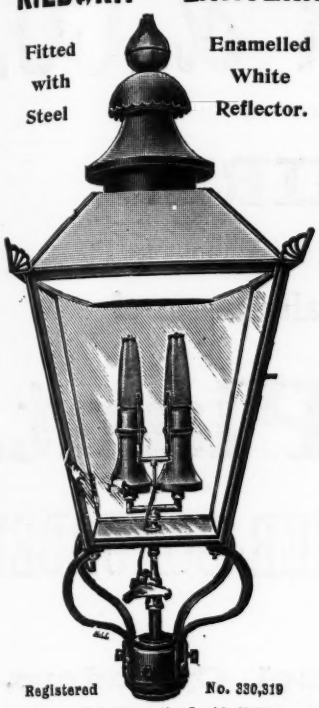

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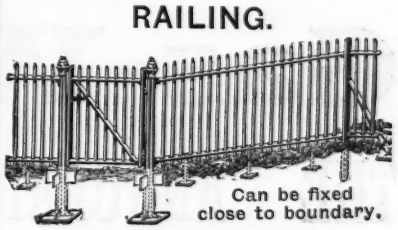

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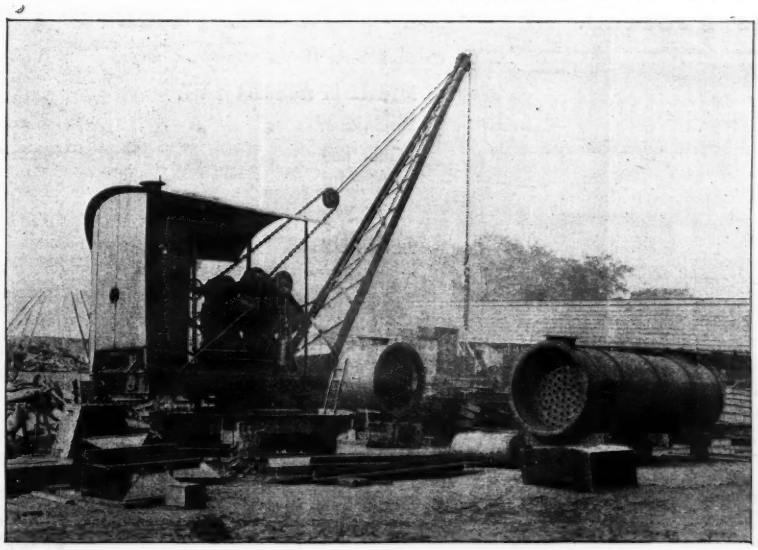

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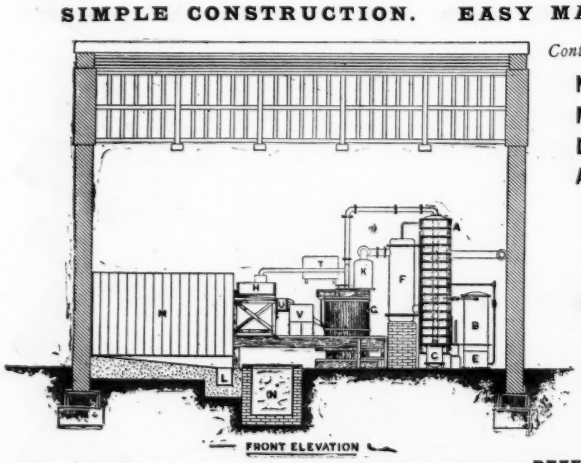

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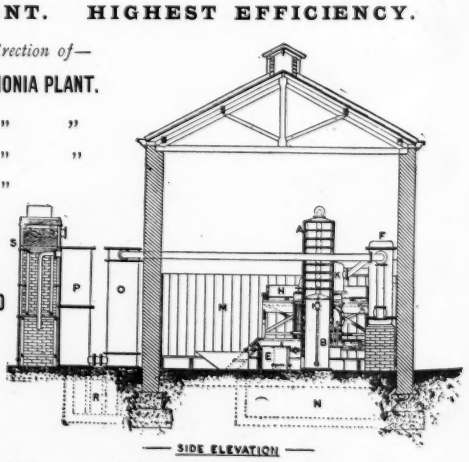

REFERENCES.

A. Large Still (Ammonia).
B. Small Still (Lime).
C. Spent Liquor Valve.
E. Limeing Arrangement.
F. Heater.
G. Saturator.
H. Draining Table.
K. Lead Catch Box.
L. Mother Liquor Well.
M. Sulphate Store.
N. Acid Store Tank.
O. Condenser.
P. Scrubber.
R. Settling Tank.
S. Neutralization Plant.
T. Acid Supply Tank.
U. Mother Liquor Trough.
V. Mother Liquor Receiver.

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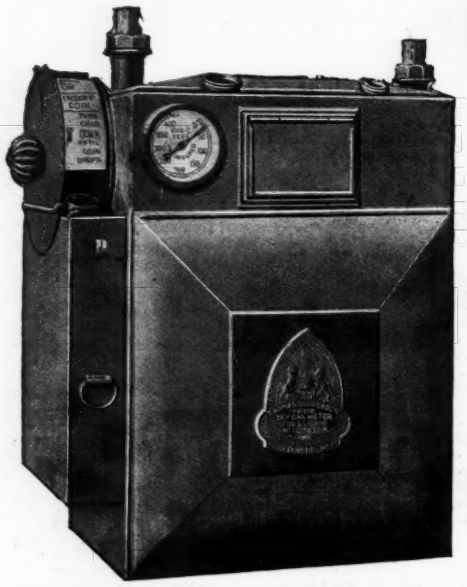

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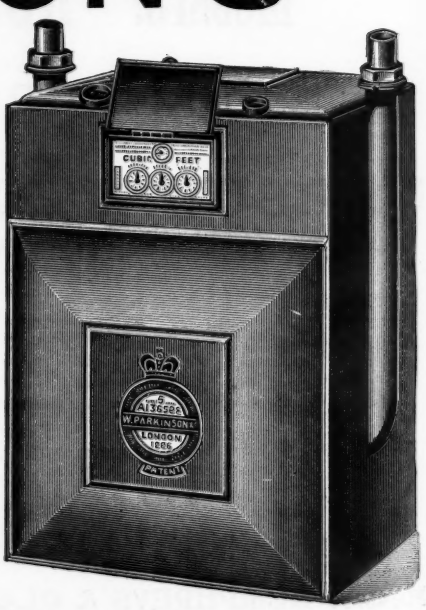

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VOL. LXXXIV., No. 2114.—TUESDAY, NOVEMBER 17, 1903.

EDITORIAL NOTES.

Meeting of the Southern District Association.

THE Southern District gas managers had an eminently successful and pleasant meeting on Thursday last, under the presidency of Mr. J. Tysoe, when some necessary routine business was transacted, and a couple of highly interesting papers were read and discussed. A full report will be found in another column. The new President of the Association is Mr. Douglas Helps, of Reading; and the Vice-President is Mr. S. Carpenter, of Dorking. The Naphthalene Committee presented an interim report, which, though breathing some hope, was not aggressively optimistic. A good audience listened patiently to the reading of Mr. S. Carpenter's paper on the working of the auxiliary carburetted water-gas plant at Dorking. It must be said at once that this was a very good paper indeed, and one that will be found most useful by all inquirers into the general question of the advantages of a combined plant. It left nothing to be desired on the score of candour and of completeness of the record, but is in every respect exactly the kind of professional paper that District Gas Managers' Associations exist to elicit. Into the merits of carburetted water gas it would be superfluous to enter in this connection. As we remarked many years ago, the relative economy of the manufacture depends mainly on the price of oil, which is a very big subject to master. Most of the rest is detail. It is only common justice to admit, in the most public manner, that Mr. Carpenter supplies corroboration of some statements previously made at Tottenham and elsewhere, to the effect that carburetted water gas now possesses positive recommendations of its own to British gas managers, besides the consequential and ancillary advantages on which its early partisans chiefly insisted. With this the question of merit may for the time being be allowed to rest quietly, for individual judgment on particular cases.

The discussion on Mr. Carpenter's paper was lively and well sustained. It would have filled without difficulty, and to considerable advantage, the whole of the time at the disposal of the meeting. As it was, several questions that would have been put remained unuttered; and the whole debate was distinctly hurried through in order that a decent modicum of time might be accorded to Mr. J. Terrace's paper, which turned out to be a more than respectable contribution to the transactions of the Association. The author is Chief Assistant to Mr. A. E. Broadberry at Tottenham; and his maiden effort in technical literature does him the greatest credit. The strength of the Southern District Association in young men was a noticeable feature, of happy augury, at this meeting.

It was a coincidence that the character of the proceedings at the meeting, in respect to the reading and discussion of papers, amply vindicated the remarks we made a week ago (in agreement with the "Electrical Review") on the subject of the conduct of such professional gatherings. It is the fact, creditable to Mr. Carpenter, that if instructions to this effect had been given by the Committee of the Association, prints of his paper might have been in the hands of members three days prior to the meeting. It was only a question of the postage. If this had been done, the members would have come prepared to make the discussion even more to the point than it proved to be; and not a moment of valuable time would have been wasted. All important queries would have received a due meed of attention, and the occasion would have been brilliantly successful. Mr. Terrace's paper was less debateable; but as it was, it had to be passed over without the putting of half the questions which it suggested. This is a matter that really ought to receive the attention of all Association Committees, especially as Secretaries are constantly complaining of the difficulty of procuring papers. This task might not be so arduous, if authors were assured in advance that their favourite points would not be overlooked. The writer of a paper circulated beforehand could very easily start the discussion by stating in a few words, if necessary, what it is his object to prove by his paper; and then the flood-gates of appreciation and criticism would be thrown open. More than ever we are persuaded that it is a mistake to occupy the time of rare professional gatherings with the formal reading of papers—not, let it be said, on account of any particular shortcoming in this way on Thursday, but only because the experience confirms the previous reflection. Which will be the first Council or Committee to inaugurate this sorely-needed reform, and earn the gratitude of busy men? This is no trifling question, but one which goes to the heart of the problem of raising to the highest attainable degree the efficiency and enjoyableness of professional meetings.

The Plaint and Suggestion of a Tenderer.

A PRIVATE correspondent, who has read the editorial article in last week's "JOURNAL" on "Trouble in the Belfast Gas "Committee" is astonished that we (as he supposes) should regard as something out of the common the piece of favouritism which permitted one firm tendering for the Belfast coal supplies to revise their price in order to obtain a share of the business. Our innocence did not by any means extend to the belief that this instance was without parallel; it was simply used as an opportunity for drawing attention to the utter disregard of fairness involved in such an action. Not only is it unfair, but—speaking generally, and not imputing anything of the sort to the Chairman of the Belfast Gas Committee, who took an honourable course when the matter was brought to notice—it lays open those who indulge in it to the charge of transgressing, for an unworthy motive, the ethics of commercial transaction.

Our correspondent, however, who is himself a contractor for various supplies required on a gas-works, complains that he, among numerous others of his kind, are subjected to many irregularities by Gas Committees and by Boards of Directors alike in connection with their tenders—not only for coal and oil but other requisites. Favouritism, he hints, is not the only thing that is, at times, known to be at the bottom of special privileges for contractors. Strong and opulent firms who can afford to do what other men cannot or would shun to do, will frequently obtain advantages, foreknowledge, leniency, and promises that some of their competitors could never gain. The privilege of modifying tenders, after the date that they have to be lodged, is only one among a number. He cites such things as promises of a substantial share in contracts before the date of the examination of tenders by members of Committees and Boards of Directors, and of contractors' representatives, with tender forms filled in excepting the price, being permitted to supply the omission while the tenders are actually being considered in an adjoining room. In such cases, the clause in advertisements as to the last day for the reception of tenders is a ridiculous and meaningless piece of wording; and acts of the kind named deserve the strongest condemnation. Our correspondent scoffs at the idea that such things are but the outcome of zealousness in the public interest; and well he might. Committees and Boards who adopt this line of unjust action are, when it comes to be known among contractors, soon "hoist with their own petard." Contractors who know their chances of success are shadowy refrain from tendering; and others will not trouble to cut their prices fine, knowing that the "lowest or any other price" that may be proffered, if not by the right person or persons, will not be accepted. The result is that in these cases there is no real competition, and the ratepayers suffer. If it was only a question of the "interests of the ratepayers," then the ratepayers could be better served, in the event of prices not squaring with the views of the Committee, by rejecting the whole of the tenders, stating the ground for the rejection, and inviting fresh offers all round. Or if there is to be any higgling or bargaining, then in justice the higgling or bargaining should be carried on with every one of the tenderers. Only in one of these ways can the real bottom prices be obtained, and "the interests of the ratepayers" be served.

Now in what way can the injustice to tenderers and the back-door intrigue of which our correspondent complains be obviated, and honest tenderers and the ratepayers in the case of municipal transactions be protected. He offers a suggestion, and it has its foundation in those contracts where the tenders are sealed, lodged before a certain day, and the seals remain unbroken until brought before the members of the Committee at the meeting where they are to be discussed. He goes further, and would insist that none of the members should leave the Committee room until each class of tender has been disposed of, or the whole rejected or put aside for fresh offers to be requested from all who have tendered. He has seen so much of intrigue and preferential treatment in these matters that he would not leave a loophole through which such things could be perpetuated. Any amendment of price should only be granted in supplementary sealed tenders, or by telegram addressed to the Committee (and not to an individual), and reaching them before their sitting commences, in order that they might reap the advantage of any drop in the market price. Without such safeguards as these, tendering will, he declares, continue in several cases in the gas industry to be a perfect farce.

Our correspondent's panacea for the evils which exist—he does not say everywhere, but to an extent more than sufficient to justify his plaint—is one against which objection cannot be raised (in the case of the majority of gas-works requirements) excepting by those who have nefarious ends to serve. If there are sound objections, we cannot detect them, and should be glad to hear of them. Anything which will act as a defence to purity and ensure justice in commercial dealings cannot be given the cold-shoulder; and both ratepayers and most, if not all, contractors would welcome the inclusion by corporate bodies of any regulation controlling the acts of Committees in this regard which would bring about the protection of their respective interests. The Belfast incident is cited merely as an example of what may be and is done; and it shows how easily the competitive tender system can be undermined.

Adoption of Incandescent Gas Lighting in the City.

In another column will be found the gratifying news that the Corporation of the City of London have decided, on the recommendation of the Streets Committee, to adopt incandescent gaslight for the so-called side streets, at a cost to the City of nearly £3000. The Chairman of the Streets Committee is Mr. A. C. Morton, who has fought the City's battles with the lighting companies, both gas and electric, for many years. It was stated in the course of the discussion on the Committee's recommendation, that this is the outcome of fourteen years' watching and waiting to see how the struggle between gas and electricity would turn. The Committee cannot, therefore, be accused of acting in the matter hastily, or without any sufficient consideration; and the City will have its reward, after all, in the best and most modern kind of street lighting. The circumstance of the side streets only being in question on the present occasion is due to the fact of electric arc lighting being already installed throughout the main thoroughfares leading East and West through the City; but it must not, therefore, be supposed that these side streets are insignificant. The opposite is the truth—many of these thoroughfares being as densely peopled as any arteries of traffic in the world. It is also the fact that the Corporation and the public likewise have been greatly impressed by the successful lighting by high-pressure incandescent gas of the great crossing at Ludgate Circus, which has been rendered much safer and freer from traffic interruptions since this installation has been in use. Moreover, the successful lighting of the great Thames bridges by incandescent gas, every example of which will be found duly recorded in our columns, has splendidly vindicated the claims of the older illuminant, in its latest guise, to be the best of public servants. The Streets Committee have had experience of incandescent electric lighting in certain byways and courts of the City; and the experiment was not encouraging. The advance of incandescent gas lighting for the public streets has likewise been tentative; but where once tried, it has never been put out in favour of anything else.

Naturally, mention was made in the debate on this subject in the Court of Common Council, of the City of Westminster public lighting returns, the latest of which, prepared by Mr. J. W. Bradley, the City Engineer, was published last week. We desire to speak with the greatest respect of Mr. Bradley and his Corporation, who have shown themselves as laudably impartial in their views of the public and private illuminants open for their adoption. Certain electricians, and a few members of the Common Council, seem to interpret the Westminster figures as showing that some of the street arc lamps there work out cheaper than gas, on the basis of equal candle power. It is too late in the day, however, for people to expect electric arc lamps to be taken seriously for their reputed, or even their measured, candle power. Mr. Morton observed that, whereas the arc lamps in the City streets were taken at first on the suppliers' valuation of 2000-candle power, they never give more than 590 candles actual. Most likely, if the City had known the truth, the general order for the adoption of these lamps would not have been given; for a false pretence of this kind is a thing of all others that the Corporation abhor.

Lord Penrhyn's Victory.

During the past three years the development of the famous Penrhyn Quarry labour troubles has been marked in these pages, and it is therefore due to those defenders of the right cause, who throughout these weary and painful years have endured obloquy and reproach with quiet confidence in the result, to record their final and complete triumph. Lord Penrhyn, as owner of the property and the direct employer of the quarry labour, has stood out for absolute liberty of employment, against the combined forces of Trade Unionism, political enmity, and every kind and degree of interested animosity—not inspired, perhaps, by his personality, so much as by the principle to which he held, and the order in the community which he represents. Once more the powers of working-class particularism, rooted in selfishness, operating by violence, advocated by unscrupulous lying, evil-speaking, and slandering, have failed before the might of fair play resting on the law of the land. The story of the latest, and let us hope the last, Penrhyn Quarry strike and its outcome, is not one that redounds to the credit of those who organized, supported, or professed a worthless sympathy with it. In point of fact, the strike as such collapsed more than two years ago, when the quarries restarted on terms quite satisfactory to employer and employed; and the malcontents who had thrown up their employment in order to enforce their demands, found themselves powerless to prevent the resumption of work.

Still, however, the outstanders then were the majority of the old hands; and they continued to play at striking, on the support accorded to them by the various organizations of disaffection in the domain of industry. From week to week from that period, the number of men who asked for work at the quarry steadily rose; but yet the weekly meetings of "strikers" in the Bethesda Market Hall continued to be held, and some politicians and certain newspaper writers, who should have known better, still kept on prophesying smooth things, and averring that Lord Penrhyn would be "expro-" priated" for his resistance to the strike leaders. At length the pitiful pretence could no longer be maintained. Lord Penrhyn has not deviated by a hair's breadth from the line he laid down at the first. It is the disillusioned, injured, and humiliated quarrymen who have come to him—turning their backs upon their discredited "leaders," who succeeded in nothing but in aggravating the evil and prolonging the misery which they were chiefly instrumental in creating. Even these wretched wirepullers, however, are not wholly responsible for the mischief they did so much to magnify and protract to long after the hopelessness of their action became clear. The proper view of the affair to take is that held by the "Cambrian News"—namely, that this "quarry "was chosen to make a great Socialistic and Labour "experiment, and that Lord Penrhyn and the management, "the men and their leaders, have been in varying degrees "helpless and unfortunate victims." Considerable movements in civilized life, such as this industrial earthquake of Bethesda, are not produced accidentally by the will of one or two pestilent persons. The individual can do little or nothing unless the time is right, and everything else is propitious. To hold differently would be to encourage the error that the operation of social forces can be changed by the "removal" of one or two prominent personalities. It is not so, as any student of history will agree. The more profoundly one appreciates the true connection between persons and circumstances in respect to any event, the less

one is disposed to fall into the excesses of hero-worship, or to clamour for the blood of the vanquished in combat.

Whatever else the Penrhyn affair may have illustrated, it and the Taff Vale and some other recent disasters to the Socialistic and Trade Union heresy, convey one all-important lesson which those who run may read. It is that, however tolerant the freedom-loving English spirit may be of self-styled Labour-leading windbags and mountebanks, so long as these imposthumes on the body politic merely run their idle course, and exist harmlessly upon sufferance, there is not the smallest intention or desire on the part of the great British public of law-abiding citizens to allow these or anybody else to outrage by their actions the Constitution of this realm. In England, a man may speak the thing he will, so long as he respects the equal rights of others; but no profession of any "ism" known to sane or crazy humanity will be permitted to override the liberty of the subject to attend to his own business, which is our common inheritance. Because the English law does not interfere with a blatant demagogue when he merely mouths the nonsense that is in him—because the half-baked Anarchist who only clamours for control over the goods of others is not instantly laid by the heels, after the fashion of some countries where the powers cannot trust the law—the like of these noisy idiots have dared, on occasion, to flatter themselves and delude their dupes into almost believing that the law of England would bow abashed before them, whatever they might do, and the Lord Chancellor himself "stand at gaze, like Joshua's moon "at Ajalon." But, in the event, a simple puisne Judge has proved more than strong enough to reduce Trade Union pretensions to shivering impotence; and not one plain constable has given place to their violence.

The unkindest cut of all for the crest-fallen Penrhyn strike agitators is given by their whilom advocate among newspapers, the "Daily News," which calmly remarks of the formal ending of the incident by a vote of the men to give in, that "no one who has followed the fight in detail "can be surprised." This from the perfervid denunciator of Lord Penrhyn and all his agents and abettors in the great struggle! Ordinary people will be apt to think that the moment when the probability of such an issue as this first dawned on the perceptions of those who, through this vehicle of public opinion, had encouraged, if they had not greatly helped, the strikers, was the time when they should have owned up, and done their best, for the sake of the sufferers from it, to stop the senseless strife. It is no wonder that this revelation of the true character of such professed public opinion as pretended to be on the side of the strikers has been bitterly commented upon in the local newspapers which suffered abuse for upholding the rights of the matter.

Sir George Livesey on the Conditions of Profit-Sharing Success.

It was not possible last week to offer any comment upon Sir George Livesey's interesting letter on the correlation of profit-sharing and co-partnership methods for benefiting working men with the characters of the men, which formed the subject of an "Editorial Note" in the previous issue. If the opportunity for doing so had served, it would have been our pleasure to disclaim the smallest intention of placing any difficulty in the way of the multiplication of such experiments as those which owe their inception, and much of their success, to Sir George Livesey's initiative and perseverance in well-doing. On the contrary, as he admits, we have "constantly and earnestly advocated" these measures, which have notoriously attained a degree of success surpassing the most sanguine expectations; and we are not likely to change sides now. We should have thought that our position in this regard was not open to doubt. At the same time, it is of all things necessary to keep looking facts in the face; and one of the most disturbing of all the facts of the social problem is the extreme limitation of the success of profit-sharing systems of remunerating labour.

Very remarkably, this subject called for further mention last week, on the text of certain Board of Trade statistics. We did not make the facts; but it is part of our duty to try to understand them. In the exercise of this effort, the one consideration that appeared to supply an alternative to the suspicion that the seed itself—be it of thrift or any other means of elevation—might be defective, was the nature of the soil, and its state of preparation as a seed-bed. Unless profit-sharing, co-partnership, or anything else, including education, is to bear the blame of all failures to produce a good crop, it is necessary to fall back upon some other explanation; and here it is, at least for partial use. There are others; but surely the quality and condition of the soil are worthy of some consideration in connection with preparation for a harvest. Truly, it is a duty to sow, abundantly, and without being too particular as to where every seed falls. It is likewise Nature's way. But the industrial occupations of mankind do not possess her lavish wealth of incentive. It is therefore incumbent upon us to take greater pains to secure a crop than it would be if the seed were plentiful as thistledown.

Sir George Livesey surely does not forget what the breaking-up of the old ground cost him in the pioneer instance of the South Metropolitan Company. He had a terrible, painful, and costly work of clearing to do, before his seed-bed was ready. Afterwards, one may readily concede, he found an average soil, neither particularly kindly nor yet particularly stubborn, which has responded very well to special treatment. He first rooted out disaffection—that noisome weed—and now reaps contentment. It is well done; and would there were much, very much more such husbandry But it cannot yet flourish everywhere. This, and nothing. more, is the meaning sought to be conveyed by our reference to the well-known case of the shipbuilders' riveters. Sir George Livesey thinks that if these men could be removed from the operation of the system which has failed in their case to produce work for reward, they would be saved from themselves. The proviso, though grave enough, is not sufficient to guarantee a good result. Preparation must be more drastic and thorough than that; and the difficulty is, as existing religious, educational, and political agencies have failed, to know how and where to begin.

Edinburgh Electric Light Finance.

The letter from the Chairman of the Edinburgh Corporation Electric Lighting Committee which we have pleasure in publishing to-day, is welcome as affording an opportunity for reasoning out a particular case of municipal electric light finance, from the point of view of a defender of the gas interest. It is to be understood, of course, that the latter is the position always occupied by the "Journal" in relation to any electric lighting question; though it is not necessary to repeat the fact on all occasions. There being, let us say, nobody else to face the Edinburgh Corporation Electric Lighting Committee on this ground, we have ventured to do so on behalf of the gas industry in general and the gas undertaking of the Edinburgh and Leith Gas Commissioners in particular, which appears to be subjected to something very like unfair competition by the Administration of the Corporation electric light. This may seem a strange complaint to make in the circumstances. But instances are not rare of Corporation Committees working against one another; and the case of Edinburgh strikes us, rightly or wrongly, as belonging to this category.

It is a mere coincidence that Edinburgh electric light finance happened to be implicated in one number of the "Journal" with regard to two of its aspects. As our correspondent fairly distinguishes between the two references, it may be pointed out that Edinburgh is not mentioned in the earlier article on the "Depreciation of Municipal Supply "Plants," which is really only a study of the amount which it may be found necessary to provide out of revenue for this item. The matter was in type before our attention was arrested by the critical notice in the "Electrician" as to the Edinburgh electric lighting accounts. Very properly, our electrical contemporary is in the habit of making the best of electricity supply, as we do of gas; and it therefore struck us as noteworthy that this friendly critic should be moved to show that the electric street lighting of Edinburgh, now charged on a partial service schedule at £11 per arc lamp, is done at less than the actual cost price. It is generally admitted that the street lighting of a town, and especially of a capital city—to lay no particular stress on the example of such a beautiful city as Edinburgh, to which its just reputation for picturesqueness is so dear—is a most valuable advertisement of the system employed. For another thing, the public street lighting of Edinburgh, when gas after the old style was the only means available, was done with strict regard to economy; and was a byword for darkness made visible. From this miserable standard of so-called lighting

to an electric arc service at less than cost price was a great change, and one altogether to the detriment of gas.

Incidentally, in probing this state of things, it was suggested that the Edinburgh electric light accounts show no provision for depreciation (which they should do), or something equivalent thereto, before ascertaining the true cost of carrying on the service. Of course, we frankly accept Mr. Mackenzie's statement of the amounts "laid aside," as he puts it, by Edinburgh and Glasgow respectively, out of revenue, towards sinking fund and depreciation or reserve. More, there is no difficulty about admitting that the really and comparatively high rate of repayment of loan imposed upon Edinburgh escaped our notice last week. Why this enormous difference should exist as between the Edinburgh and Glasgow rates of repayment of the capital loans, does not appear on the surface. It is not, however, to be hastily ascribed to Edinburgh for righteousness, as it is obligatory. At the same time, one is not surprised to learn that Glasgow will expedite this operation in future. It is perfectly true, as Mr. Mackenzie observes, that different rates of sinking-fund contributions profoundly affect the financial position of the undertaking concerned; but the degree in which this consideration affects the obligation to depreciate, is explicitly left open in our "Depreciation" article.

Lastly, while bowing to the dictum that the writer of our "Electric Lighting Memoranda" "may set his mind at "rest in regard to the charge made in Edinburgh for public "lighting and motive power," because "those who are "managing the concern know what they are doing," one may yet ask that corresponding freedom of action in bargaining should be extended to the Gas Commissioners. We do not presume to dictate to the public authorities of Edinburgh in any matter; but it is notorious everywhere that, whereas electric lighting and power supplies are priced at any figure that may be deemed attractive to business, there is the greatest reluctance shown to allow equal elasticity in gas prices and quality; and nowhere is this difference of treatment of the two services more conspicuous than it is in Edinburgh.

The Gas Institution and the Crystal Palace Exhibition.

It is reported that the Council of the Institution have, under the circumstances upon which comment has recently been made, accepted the recommendation of the Committee they appointed in connection with the Crystal Palace Gas Exhibition to withdraw their patronage, "principally because manufacturers state that they will be quite unable to prepare their exhibits in time." Owing to the lapse and loss of time, the Council had no alternative but to drop gracefully into the position created for them by the Committee's mistaken construction of the very distinct determination to support the Crystal Palace authorities "as far as possible, with a view of making the Exhibition a success." The acceptance of the Committee's recommendation, it appears, took place at a meeting of the Council last Wednesday; but up to the time of going to press, no official intimation to that effect has been received, so that we take it the resolution is not regarded as a matter of general importance to the gas industry. When the Council gave their support to the Exhibition, an official communication was made to the Press; now the Council have withdrawn, no such official notification has been made. Of course, after what has transpired, the decision was a certainty. At the same time, the withdrawal is of equal public importance to the original resolution to support. Time was the principal factor in the case for withdrawal; and, that being so, the following record of "swiftness of movement" may be left to speak for itself:—

SEPT. 24.—Council resolve to support the Exhibition.
OCT. 14 or 15.—Committee determine to recommend withdrawal of support.
NOV. 11.—Council accept the recommendation of the Committee—

leaving only two or three days over four weeks before the date advertised for the opening of the Exhibition! This was the first definite resolve of the Council to attempt to do some useful public work for the gas industry outside the fundamental objects of the Institution; and it is a matter for regret that it has ended in such vacillation and signal failure. It is to be hoped that their next essay at being of service to the industry beyond the bounds of technical work will—by united, energetic perseverance—meet with a success of which they may be proud.

A Modest Request.

The following modest request has recently been sent, accompanied by a stamped envelope (which prodigality deserves mention), to the Managers of neighbouring gas-works by the Hon. Secretary of the Swindon Traders' Association: "The question of the price charged for gas by the Swindon Company (*i.e.*, 3s. 9d. per 1000 cubic feet) is being considered by our Association, with a view of petitioning for a reduction. I shall be obliged if you will kindly inform me (1) the price of gas per 1000 cubic feet charged by your Company, and (2) the price of coal, so as to enable me to prepare a statement in support of our petition." Really, we are getting quite an interesting collection of these precious inquiry circulars. The present example, however, has a distinguishing characteristic of its own. The writer not only asks, as many of them do, men on whom he has no possible claim whatever to supply him, free of charge, with information, but frankly states that he requires the particulars for the purpose of bringing pressure to bear on another gas undertaking. In any event, it would be difficult to find a word to say in favour of a feeless inquiry of this kind; but the purpose with which it is avowedly made, renders anything else than wholesale condemnation absolutely impossible. Requests like the one under notice, when they are distributed, have, like other things, a proper place; and in their case this proper place is clearly the waste-paper basket. The only thing about them worth having (when it is enclosed) is the penny stamp.

Corporation Indebtedness.

Judging from the tone of many of the speeches made on the occasion of the recent elections of Mayors throughout the country, the severe depression of gilt-edged securities which has of late been experienced has not been without its effect on some of those municipalities who must be held—to a certain degree, at all events—responsible for the existing state of affairs. The note of caution in regard to expenditure of capital which has been sounded in several quarters comes as a welcome change indeed from what we have of late been accustomed to, though it would certainly have been very much better if it had made itself heard a little earlier. Then there might have been held to be some choice in the matter; while now, practically speaking, there is none at all. Repeated failures to issue new loans, have left the local governing authorities with no alternative whatever but to cut down capital expenditure to the lowest possible limits. The lesson has been a very hard one; but it really seems that in this case, as in most others, out of evil good will come. At Nottingham, the Mayor Elect, when returning thanks, impressed upon the Council the urgent necessity of proceeding cautiously with regard to any capital outlay, and of exercising strict economy in the expenditure of any income at their disposal. He put the case as mildly as possible when remarking that the Money Market at the present time was "in a condition adverse to municipal borrowing," and that, rightly or wrongly, a strong feeling existed that, in consequence of the ease with which money could be borrowed at a low rate of interest, municipalities had indulged in extravagant expenditure. Apparently these views met with the hearty approval of his audience, as also did the statement that it would be imprudent to further largely increase their capital indebtedness, unless accompanied by a corresponding substantial and steady growth of the rateable value of the city. At Halifax, too, we notice that the newly-elected Mayor gave it as his opinion that in municipal matters "they must not only put on the brake, but for a time stop the train; and purchases, as far as they could be avoided, must cease." In thus advocating economy, he suggested that the officials might even do more than the members of the Council to secure the object they all had in view, if only they would make proposals whenever they could for curtailing expenses.

Some Figures and their Application.

Yet another case is Sheffield, where the Lord Mayor was, if possible, even more emphatic on the same subject. Referring to the opinion of some of the members that the low price of corporation stocks was entirely due to the action of London brokers, he called attention to the following facts, and asked his hearers to judge for themselves of their importance and the bearing they

had on the matter. The loans to local authorities, which in 1875 stood at £92,820,100, on March 25, 1901 (the latest figures available), had increased to £316,704,222, and were at the present time, of course, considerably more. The London County Council, when recently increasing the rate of interest charged on loans to local authorities, took the opportunity of emphasizing the desirability, in view of the existing financial conditions, of such borrowings being restricted as far as possible to schemes of an urgent character. He also found that this subject was engaging the attention of most of the other municipalities of the kingdom; and under these circumstances, he asked the members of the Council whether it was not time, so far as any large new capital expenditure was concerned, to cry "Pause." What they were already committed to, they must go on with; but even with regard to these cases, it would at present be wise to go slowly. But, added his Lordship, there were other projects which some members had very dearly at heart, which he knew they desired should be self-supporting, but which, if pressed forward in the existing state of the Money Market, would certainly tend to defeat this wish. These are words of wisdom indeed; and, as already remarked, we are only sorry that they come so late in the day. However, "better late than never." The cries of "Hear, hear" with which the remarks were greeted, are a gratifying indication of the state of mind of the Sheffield City Council. But there are other authorities who still stand in much need of a similar warning voice in their midst; and to them we commend the views of the Lord Mayor of Sheffield.

Superannuation for Municipal Workmen.

The claims of their workpeople after a long term of service are all too frequently overlooked by municipalities, who, on the other hand, do not forget their high officials and police—giving them compensation or pensions according to their positions. Yet when it is remembered that the municipal workman has little to look forward to save the workhouse, if his position has not been one in which something could be saved to contribute to his later needs, it will be seen that it can cost the ratepayers but little more to give him a pension (after a number of years' service and on attaining a certain age) than to permit him to suffer the indignity of becoming a pauper. The gulf between a pensioner and a pauper is great; the difference in cost to the ratepayers between the one and the other is small. The matter was discussed at the last meeting of the Liverpool City Council on the consideration of Standing Order No. 77, which provides for a sum not exceeding £2 for every year of service being given to Corporation labourers who may become unfit for work. A rider was proposed by Mr. Thomas Roberts to the intent that a labourer having been in the service 25 years, and having attained the age of 65, and being incapacitated for further duty, should be paid a sum of not exceeding 5s. per week during the pleasure of the Council. One member thought a pension of 10s. a week would not be too much; while another considered a scheme should be formulated under which workmen should be entitled to compensation. The Council very wisely agreed that a Committee, consisting of the Health Committee and Chairmen and Deputy-Chairmen of all the other Committees affected should be appointed to report on a scheme of superannuation. Their report, and the ultimate decision of the Council in the matter, will be of interest, and should, if the result is as we expect it will be, give a fillip to the consideration of the question by other municipalities who have not accorded to it thought, or taken any steps in regard to it. If municipalities cannot look after their aged workmen, who can?

The Christmas Box Question.

The present time (when the Festive Season is again so close upon us) is an appropriate one for referring once more to the vexed question of Christmas boxes and their abuse. When noticing, at the beginning of August, the fact that a meeting of some traders had been held in London to discuss the advisability of altogether abolishing Christmas presents, we ventured to remark that if these firms could not see their way to take combined action in the matter, gas engineers and managers could themselves strike an effective blow by absolutely declining to accept from manufacturers any gift the value of which was such as to give them good cause to think that the offering of it was prompted by a less worthy motive than friendship. There are doubtless many who have all along acted upon this principle; and it is to be hoped that our strictures have caused many more to resolve upon following so good an example. Be this as it may, however, there is evidence that the members of local authorities at any rate are becoming aware of the dangers of what can only be regarded as a most pernicious system. We refer to the conditions laid down by the Wishaw Town Council in connection with their recent appointment of a new Gas Manager. It was proposed in the Council that this official should be forbidden to accept commission on any purchases or sales made in connection with the works, or to receive any presents; and in the result it was agreed that the Manager "should not be entitled to take or receive any commission, discount, or perquisites on goods purchased by the Council for the gas-works." This, of course, does not, and cannot, reflect in any degree whatever upon the particular gentleman in question; it is the custom itself that is aimed at. The Provost remarked at the meeting that if it was the practice at Christmas to give presents, he did not see any harm in the Gas Manager accepting them; they might only be turkeys. Certainly they might; and if they were, we agree that no harm would be done. But if they were more than turkeys, what then? A genuine Christmas present, given out of pure goodwill, is all very well; but nobody can pretend that the expensive gifts which too frequently pass between business acquaintances come within this category. They may assume the name; but their true nature is not thereby one whit altered. Though greatly to be regretted, it is only in the natural order of things that the innocent present should, to some extent at least, have to suffer with the other.

WATER AFFAIRS.

The Water Diviner and His Powers.

THOSE of our readers who have bestowed more than passing attention upon the paragraphs which have appeared from time to time in the "JOURNAL" on the subject of the use of the divining-rod in searching for water, cannot fail to have been struck with the remarkable success which, as a general rule, has followed the operations of the "dowser." That a man holding a hazel twig in a particular manner should be able, by its movements, to locate water beneath him, seemed to be something so extraordinary, that people were greatly disinclined to attribute the result to anything more than a fortuitous combination of circumstances. They declined to believe in the existence of any occult power on the part of the diviner, especially as in some cases his predictions were not verified when, at some cost, his advice had been followed. At the same time, when confronted with the fact that, out of 152 cases in which the services of water-finders had been called in, only 12 of them were unsuccessful, the incredulous were almost compelled to acknowledge that there was "something in it"—to practically admit, in fact, that as, in times of old, "to one was given the gift of "healing and to another the working of miracles," these people had been endowed with some special quality which differentiated them from their fellows. The suggestion that the successes referred to were due to some idiosyncrasy possessed by the operators, brought the matter within the cognizance of the Society for Psychical Research; and Mr. W. F. Barrett, the Professor of Experimental Physics in the Royal College of Science for Ireland, undertook at the request of the Council, a systematic investigation into the subject. At first he thought it to be utterly beneath scientific inquiry; and he approached his task with some amount of repugnance, hoping that a few weeks' work would enable him, as he says in the introductory remarks to his first paper presented to the Society, to relegate the matter "into a limbo, "large and broad, since called the Paradise of Fools." The worthy Professor, however, had reckoned without his subject. The investigation he thought to get through in a few weeks has lasted until now.

The conclusions arrived at by Professor Barrett are that the twisting of the forked twig used by the diviner is due to involuntary muscular action on his part, and that this is the result of an ideo-motor action; further, that any idea or suggestion associated in his mind with the movement of the

twig would cause it to turn spontaneously in his hands. Dismissing the mere twisting, Professor Barrett inquired how the suggestion which started the involuntary muscular action was derived. This question he found to be an extremely complex and difficult one to answer. Careful and critical examination showed him that certain diviners, though not all in whose hands the twig would turn, have a genuine faculty for finding underground water beyond that possessed by ordinary well-sinkers; and he says their success is due, in a measure, to "shrewd observation, and "the conscious or unconscious detection of the surface signs "of underground water." The rest of the successful divinations—some 10 or 15 per cent.—cannot be explained; nor can they be put down either to chance or to lucky hits, as the proportion is larger than the doctrine of probabilities would account for.

Discoursing upon this subject at a meeting of the Society a few days ago, Professor Barrett said he thought the true explanation was probably to be found in something altogether new to science—namely, the possession of a "sub-"conscious super-normal perceptive faculty;" so that any object sought for excited an impression on the possessor when he approached it, although the object might be far beneath the surface of the ground. A good diviner was therefore one who was endowed with this power, and who instinctively allowed it to be operative when dowsing. He pointed out that for something like 250 years it had been noticed that children or simple country folk, whose minds were free from preconceived ideas or reasoning, were the best dowsers, being less liable to auto-suggestion. He reiterated the opinion expressed in an earlier stage of his investigations, that it is absurd to infer *a priori* that the motion of the twig is due to a particular stimulus arising from the presence of underground water. The rod is, in fact, according to Lord Kelvin, utterly useless. The whole power, in his opinion lies in the operator, who, according to Professor Barrett, experiences "something akin to an emotional disturbance" by the discovery of the object of his search. This would result in certain changes in the circulation or in the arterial pressure of the blood; and it is thought that modern sensitive methods of detecting and registering these changes might supersede the divining-rod. It may not be uninteresting to add that Sir William Crookes, who presided on the occasion of Professor Barrett's lecture, in the course of a communication to Mr. J. Mansergh a few years ago, said his own view of the subject was that the motions of the twig are "entirely pro-"duced by the muscular movements of the dowser, and have "nothing whatever of the so-called supernatural about them." These may be taken as the latest conclusions arrived at from the study of the water-diviner and his powers; and it appears from them that he must henceforth be raised to the dignity of a "medium" rather than stigmatized a mere trickster.

There has lately been issued as a Blue-Book Part III. of the general report and statistics of mines and quarries compiled by Mr. (now Sir) C. Le Neve Foster, F.R.S. In the introduction it is stated that the value of the mineral products of the United Kingdom last year was £107,134,854—a decrease of £8,000,000 compared with the preceding year, owing to the reduced prices paid for coal. The total output of coal was 227,095,042 tons, which is the largest on record, for it exceeds by 1,913,742 tons the quantity produced in 1899. Compared with that of 1901, there is a rise of 8,048,097 tons, due mainly to the larger number of persons employed. We consumed 166,694,908 tons in the United Kingdom, or nearly 4 tons per head of the population. The quantity of coal exported, exclusive of coke, patent fuel, and coal shipped for the use of steamers engaged in foreign trade, was 43,159,046 tons, an increase of 1,281,965 tons compared with the preceding year, and a decrease of 930,151 tons compared with 1900.

The Société Technique de l'Industrie du Gaz en France have issued a report, prepared by M. Joseph A. Payet, their Literary Secretary and Record Keeper, of the proceedings at the 43rd annual congress of the German Association of Gas and Water Engineers, held in Zurich on the 24th, 25th, and 26th of June, under the presidency of Herr Beer, the Manager of the municipal water-works in Berlin. The proceedings, it may be remembered, were noticed at the time by a representative of the "JOURNAL" who attended the meeting. A chapter is devoted to particulars relating to the supply of gas and electricity in Switzerland, and another deals specially with the gas supply of Zurich. An interesting feature of the meeting was the visit paid to the fine works of the Municipality at Schlieren, which were fully described and illustrated in our pages early in 1901. Tabulated statistics of the results of working from 1893 till last year, some of which were communicated to the congress by M. Weiss, the Municipal Gas Engineer, add to the completeness of the information furnished in regard to this undertaking.

ESSAYS AND REVIEWS.

SOME REFLECTIONS ON MR. BRADLEY'S STREET LIGHTING REPORT.

SINCE the publication last week (p. 350) of the notice of Mr. J. W. Bradley's report on the various systems of lighting in the City of Westminster, a little reflection has suggested one or two points for further comment. It was remarked as a gratifying feature that the figures (confirmatory of former ones) referring to the high-pressure gas system as represented by the Sugg lamps in Whitehall worked out far cheaper per annum than the electric arc lamps; while the illuminating power attributed to them was only 70 to 100 candles less than that of the latter. This difference is not a considerable one when dealing with illuminating power by hundreds of candles, and when it is considered that the Sugg lamps are cheaper per annum by as much as in one case £15 15s., and in another £11 15s. The Hyde Park electric arcs are only £3 15s. more; but there must be some special reason (of which we have no knowledge) for this, in view of the great differences in price in the other sets of arcs.

Upon further consideration, however, we are far from satisfied that Mr. Bradley has photometrically done justice to the high-pressure gas-lamps, notwithstanding what he apparently regards as his precautionary measure of making his tests at three different angles; and we will give reasons for dissatisfaction. Each of the lamps referred to is fitted with three of Sugg's high-pressure burners; and the total illuminating power ascribed to each lamp is as low as 481 candles. Now it has been demonstrated over and over again that these burners, with a consumption of 10 cubic feet of 16-candle coal gas, will give a light of 300 candles. Therefore $300 \times 3 = 900$ candles. Where have the 419 candles disappeared to in the case of the Whitehall lamps? It may be suggested that a part of the loss is due to the fact that the gas supply contains a proportion of carburetted water gas; but, if this is so, it could easily be remedied by slightly increasing the consumption above 10 cubic feet. Be that as it may, it will not account for the loss of the 419 candles. Look at the matter in another way for proof of inaccuracy. The consumption per lamp is 30 cubic feet an hour, and the average illuminating power, according to Mr. Bradley, is 481 candles. This is only equal to 16 candles per cubic foot, which is ridiculous for burners which, tested under standard photometric conditions, will return a duty of 30 candles per foot. Look lower down the table published last week, and it will there be seen that ordinary single incandescent burners, consuming $3\frac{1}{2}$ cubic feet an hour, are credited with an illuminating power of 41 candles, which is equal to 12 to 13 candles per cubic foot of gas. Is an improvement of a fraction over 3 candles all that can be obtained per cubic foot of gas from the increase of pressure in the Sugg lamps? In the light of knowledge on the subject, it would be, if Mr. Bradley will pardon us saying so, absurd to seriously entertain the declaration of his tests on the point; and we may suggest to him, and even assert, that a mistake has been made somewhere.

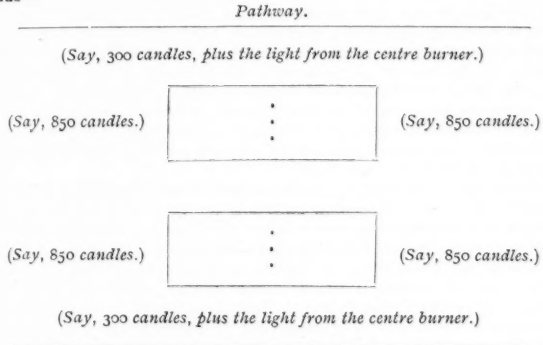
Go a little further. In these lamps, with 16-candle coal gas, there should be 850 to 900 candles; and with the reflector there is practically 1000 candles. Of course, this extra light obtained by the aid of the reflector is not realized at a distance away; but it is locally a very useful addition. The lamps are situated on the refuges in Whitehall; and it is these refuges—just where it is required—that get the advantage of the extra light. With confidence, we would ask any unprejudiced person to inspect the lamps and any of the electric arcs mentioned in the table, and say whether or not they are in agreement with us that the lighting at the foot and in the neighbourhood of the high-pressure gas-lamps is not far superior to that from the electric arcs, which are accorded by the tests from 70 to 100 candles more illuminating power. This is a point of which Mr. Bradley does not appear to take any account, nor give the high-pressure lamps any credit for. Of course, the whole of the 900 or so of candle power cannot be carried the whole length of the portion of the road lighted by the lamps; and with such lamps it is utterly impossible to get the whole of the light into the photometer-box under the conditions obtainable in the streets. The photometer which Mr. Bradley uses is, we believe, fitted with a two-candle pentane lamp as the standard, and is doubtless as correct as anything of the kind can be. But as has often been said before, we are far from convinced as to the correctness of tests taken under these conditions.

Assuming accuracy in all other respects, here is a suggestion of how the tests of these high-pressure gas-lamps may be—"are" might safely be written—injuriously affected as compared with the electric arc lamps, no matter whether the burners are grouped $\circ^{\circ}_{\circ}$ as was formerly the case, or in trident form as now !!!. The globes of the electric arc lamps are without ribs; while the high-pressure burners in Whitehall are enclosed in lanterns of octagon shape. Mr. Bradley states that his tests with the burners arranged in trident form are taken at three different angles. Now we fail to see how it is possible to get tests in three different positions without some of the light being cut off by one of the ribs of the lantern, or by the light of one burner being intercepted by its neighbour. If the light from the three burners

could be, without anything interrupting it, got into the photometer-box, a far different result would be obtained than 481 candles. Therefore, it must be maintained, from these various considerations, that the average candle power ascribed to these lamps in Mr. Bradley's report is not correct, and does serious injustice to them—particularly taking into account the extra light realized in the region of the lamp benefited by the reflector.

There is another point which may be offered for consideration. Not long since, in a paper read by Mr. Sugg, he spoke approvingly of the use of small gas-engines for raising the pressure of the gas in this system, and spoke of their cheapness in certain situations as compared with water-motors. We should fancy that the expense for the gas used in raising the pressure of 1000 cubic feet up to 10 or 11 inches would be little, if any, more than ½d.; and it is well known that at Westminster the cost of doing the same thing by water power is considerably more than this. If the difference is such as we anticipate would result in respect of the working expenses by the change, the high-pressure gas lighting would be placed on an even more favourable footing than is shown by Mr. Bradley's table. But this is touching on a matter that only concerns Mr. Sugg and those whom he is serving. Our excuse must be that we want to see the best done for gas in Westminster that can be achieved—more particularly as the City Council have as their Engineer and adviser such a student of these matters as Mr. Bradley has proved himself to be.

A few words more as to the alteration that has been made from the triangular grouping of these high-pressure burners to the trident form. The improvement produced, as referred to by Mr. Bradley in his report, can be readily admitted; and there is no doubt that the change is one (we are not aware whether it emanated from Mr. Sugg) which will be largely copied. Formerly the burners were, as already stated, grouped in this form ∴; and it is conceivable that a portion of the light from each burner was obstructed by its two neighbours. If the matter is studied, it will be seen that it is so. Now the burners are placed trident fashion, with the centre one raised above the outside ones. The burners are fixed so as to all three face lengthways of the road, thus—


Pathway.
(Say, 300 candles, plus the light from the centre burner.)
(Say, 850 candles.)
(Say, 850 candles.)
(Say, 850 candles.)
(Say, 850 candles.)
(Say, 300 candles, plus the light from the centre burner.)
Pathway.

This shows the advantage of the arrangement. The bulk of the lighting power of the burners is distributed along the roadway; while the light from one burner, *plus* that obtained from the raised centre burner, is thrown on to the pathway. Clearly, this is the most sensible way of using three incandescent burners in one lantern for such positions—in fact, there is no question, from this experience in Whitehall, that the fullest lighting value possible from three burners is obtained by the arrangement.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 436.)

BUSINESS on the Stock Exchange last week was a good deal under a cloud. Though it opened without alarm, it soon grew apprehensive, and things in general fell very flat under the combined influence of war fears and a prospect of dearer money. But when Thursday passed without a rise in the Bank rate, one source for uneasiness was disposed of, and then the other began to quiet down, so that by the close there was a little recovery from the worst. Consols, however, were still heavy losers. The settlement passed off without difficulties. In the Money Market, the position stiffened considerably up till Thursday, when the tension relaxed. In the Gas Market, the volume of business showed no perceptible increase compared with the week before; but there was a little more activity in some issues which had recently been somewhat becalmed. The tendency was favourable, in spite of the general flatness elsewhere, and several stocks made moderate advances, while only one receded for special reasons of its own. In Gaslight and Coke issues, the ordinary was moderately dealt in daily at prices which varied but little. The opening figure was 85½, and the closing one 85¾; and all dealings were never more than half-a-point wide of these figures. The secured issues continued as firm as they have ruled for some weeks past; and the preference made an advance of a couple of points. South Metropolitan was rather languid and uncertain, zig-zagging backwards and forwards from 118 to 120. Nothing was marked in Commercials. In the Suburban and Provincial group, there was scarcely any business done. Southampton marked a point higher on *ex div.* variation; and in the local Exchange Newcastle had a fractional advance. In the Continental Companies, Imperial was fairly brisk; and added another point to its gains of the preceding week. Both Europeans advanced; but Union was flat, and the preference receded five points. Among the remoter undertakings, Bombay and Monte Video had an advantage in *ex div.* variations. Business in the Water Companies was very quiet, and the tendency was all downward. East London was marked down below 200 at last, changing hands at 199 on Tuesday. New River was done on Wednesday at 377; the buying price being promptly put down to 370. But, nevertheless, the selling price was left at 390.

The daily operations were: On Monday business in Gas was quiet, and prices generally were good; but Union preference fell 5. In Water, East London receded 3; and New River and Lambeth 7½ per cents, 5 each. Tuesday's Gas transactions were a little more lively; but quotations did not move. In Water, East London fell 2, and Southwark 1. Wednesday was rather quieter. Imperial advanced 1. In Water, Southwark dropped 2. Thursday was steady, and several issues advanced *ex div.* Friday was more active, but without making any changes in quotations. Saturday was quite quiet; but both Europeans advanced ¼.

ELECTRIC LIGHTING MEMORANDA.

The Problem of the Penny Unit Again—The Newport (Mon.) Case—The Question of Load-Factor—The Example of Leith.

THE question of the supply of power is still in suspense in different parts of the world, and will remain so for some time yet. In this country, it takes a particular expression, which may be roughly described as the problem of the penny unit. Various and sundry electricity-in-bulk ventures are committed to the solution of the problem in this form, on pain of liquidation; and no man can say as yet how they will fare. In the meantime, as our readers know full well, local authorities supplying electricity for lighting and other purposes, are offering the penny unit on all sides, purely as a speculation. There is no agreement as to the economics of this offer; some holding it to be sound business, while others regard it as sheer "dumping," to use a designation which has become a "word of fear" in these latter days. A good example in point is supplied by the case of Newport (Mon.), which has already been discussed in these columns. There appear to be members of the Newport Corporation who are not happy in regard to the proceedings of their Electricity Department. At the last Town Council meeting, the Chairman of the Electricity and Tramways Committee, Alderman Moses, brought up the report of the Committee, and with it announced his intention to resign. In doing this, he took the opportunity to deny that he had been extravagant or had sanctioned a certain outlay which had been decided upon. He admitted that "a lot of money had been spent which had been forced upon the Committee and was inevitable." The electrification of the tramways does not seem to have proved very profitable; one Alderman observing that the undertaking must be conducted at a great loss.

Another member of the Corporation brought up again the recommendation of the Committee to supply power and light to a private firm at 1d. per unit, on the estimate that the consumption would amount to 250,000 units per annum. He understood that the cost of generation was 1·76d. per unit, excluding the capital charges and depreciation; so that there would be an apparent loss on this supply of ¾d. per unit, which would be increased to 2d. per unit if the capital charges were included. This allegation raised the old question again in an acute form; and while some members of the Corporation took one view of the average costs and others did not agree with them, one Councillor blurted out the controlling fact that the South Wales Electrical Power Distribution Company were offering to sell power at ¾d. per unit, and "there was no power on earth to prevent the Company from coming into the borough and laying down their plant, if the Council did not supply the power at a cheap rate." In the event, the Council decided to hear the Electrical Engineer, Mr. Collings Bishop, who explained that the price at which a supply could be given depended on the load-factor. The local reporter made him say "low factor," which does not facilitate comprehension of the point by the Newport public. The load-factor of the Newport electricity generating plant is indeed low at present, being barely above 10 per cent., which accounted for the unfavourable state of things mentioned in the Council. If this factor could be raised to 20 per cent., an increase in profit would at once accrue. The South Wales Electrical Power Distribution Company hoped to get a load-factor of 30 or 40 per cent., and to sell at from ½d. to ⅜d. per unit. The Corporation plant could produce the power wanted at an additional cost of 0·6d., which would leave 0·4d. profit. This did not include capital charges. Thus spake the Borough Electrical Engineer.

It is difficult to repel the suspicion that, in taking on this new business at the penny rate, the Newport Corporation are entering upon a very speculative line of business. It is a development of municipal trading which can only be justified by the result, if

truly successful in every sense. We are not for the moment discussing the morality of municipal trading in the abstract, which would be an idle pastime. The Newport Corporation, like many others, have a costly electricity supply undertaking to make the best of; and the Manager truly states that the matter of profit is chiefly one of the amount of business done. The term "load-factor" has caught on, and is useful in its way as an expression of a reduction to measurement of the old principle that profits depend on the turnover. At the same time, there is some risk of the term becoming conventionalized and passed into currency as a source of comfort and joy, like the "blessed word Mesopotamia." For while it is quite correct to say that an increase in the load-factor of a central station from 10 to 20 per cent. would augment the profits—which is only a scientific way of saying that it would pay to double the amount of trade without increasing the expenses—the question that suggests itself is: What are the prospects of so desirable a consummation being achieved? A load-factor of 10 per cent. is by no means unusual for an electric lighting station; and it is a far cry from this to 20 per cent., which is enjoyed only by those generating stations which have been exceptionally fortunate. This light and airy bound from an unprofitable 10 per cent. to a happy and prosperous 20 per cent. is an o'ervaulting ambition.

A tramway-load of substantial proportions is assumed to be the desideratum of all electricity supply undertakings; but experience shows that the supply has to be priced at so modest a figure that it does not greatly benefit the finances of most of the stations concerned in the business. Yet the load-factor of a tramway supply plant may easily attain the relatively high figure of 35 per cent. Apart from any traction branch, one of the electric lighting and power concerns with a comparatively high load-factor to its credit is that of the Leith Corporation, with the figure of close on 20 per cent. for the past two years, which is surpassed by few in the United Kingdom. This makes for a low costs account; and accordingly the charges on revenue work out to 1·17d. per unit. Even here, however, the price of electricity for power and heat is not less than 1¾d. per unit. The load-factor is clearly not everything; for the undertaking does not yet pay very well. Still, it is better than most; for the gross profit amounts to more than 8 per cent. on the capital expenditure of £82,000, which ought soon to increase sufficiently to enable the depreciation fund to be started. From anything that has yet been realized in the most successful undertakings, there is a long gap to be spanned before the load-factor spoken of in connection with the South Wales Electrical Power Distribution Company, which is to enable them to serve large customers at 0·6d. per unit, can be reached. As to this price, therefore, it will be pretty safe to wait until one sees it before building anything on the possible prospect. A good deal of capital will disappear first, wherefore it is reasonable to felicitate those lucky firms who can find amiable corporations to serve them with electric power at 1d. per unit, and to express the hope that such a boon will prove good for trade. That Newport, in making such a bargain, is only following the example of many other places, is perfectly true; but this fact, having regard to the character of municipal trading generally, is not conclusive evidence of the wisdom of the expedient. We come back, therefore, to the statement that the justice to all the interests concerned, of this Corporation dealing in the penny unit, is open to question. Without being misled by the fallacy of averages, it still remains doubtful if such a tremendous "cut" in the price of the unit is sound practice in any case. On the other hand, the nature of the temptation to make the offer is clear enough, especially where expectations formed with regard to the extent of a local demand for electric light and power have been disappointed.

The list of Mayors for the new municipal year is again conspicuous for the number of elections of gentlemen more or less closely connected with the gas industry. Beginning with the Metropolitan Boroughs, it is not a little curious that the Chairman of a Gas Company and the Director and former Secretary of a Water Company—Mr. Alexander Dickson—should be succeeded as Mayor of Deptford by Mr. W. A. Schultz, of the firm of Messrs. Schultz, Comins, and Co., who is the Secretary of the Ascot District Gas Company and other undertakings. In Birmingham, Alderman Halliwell Rogers, the re-elected Lord Mayor, was Chairman of the Gas Committee. At Dover, Mr. A. T. Walmisley, M.Inst.C.E., whose name will be remembered by many of our readers in connection with his Gas Institute papers on "Roofs," &c., is the new Mayor. At Eye, Mr. C. Tacon, who has been re-elected for the ninth year in succession, is the Chairman of the Gas Company. Alderman Josiah Wade, re-elected at Halifax, has been for many years the Chairman of the Water Committee. For the third time, Alderman John Monkhouse has been chosen Mayor of Kendal, where he fills the position of Chairman of the Gas, Water, and Electricity Committee. One of the most noteworthy re-elections is that of Alderman E. Finn, the Chairman of the Lydd Gas Company, who holds the office of Mayor for the sixteenth time. At Pudsey, Alderman M. Walker, who has been re-elected, was instrumental in obtaining the water-works for the town. Among the newcomers who are Chairmen of Gas Committees are Alderman H. Cowburn, of Leigh (Lancs.), Alderman W. Walker, of Middleton, and Alderman C. B. Holmes, of Wigan.

CITY AND GUILDS OF LONDON INSTITUTE.

The "Gas Manufacture" Examinations.

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus) the report on the work of the department in the past session.

The report opens with the very gratifying statement that since the passing of the Education Act of 1902, further encouragement has been given by the Board of Education to the teaching of technology. Partly to this action may be ascribed the further increase in the number of technological classes registered by the Institute in the session 1902-3, and the greater number of students in attendance; the former rising from 2329 to 2789, and the latter from 36,189 to 38,638. The examinees in Great Britain and Ireland now number 17,987, compared with 16,580—an increase of 1407, which is 384 more than the increase of last year over the numbers in 1901. During the past session, effect was given to many of the arrangements for co-ordinating the work of the department with that of the Board of Education suggested by Sir William Abney. Under them, the entire work of a technical school, whether in science, art, or technology, is taken into consideration in the assessment of grants, and due weight is given to the reports of the Institute's Inspectors and to the results of the examinations in determining the efficiency of the teaching provided in the several schools. A large number of full technological certificates, awarded on the results of the examinations, have been stamped by the Board as having been issued under conditions approved by them; and a note has been inserted in the regulations for evening schools and technical institutions, that the "first-class full certificate in any technological subject will be recognized as affording evidence of competence to teach the subject." It is pleasing to find that the Institute continues to receive some very valuable assistance from trade organizations, many of which now take a keen interest in technical education, and recognize the advantage of employing technically trained operatives. In addition to the valuable scholarships and prizes offered by local authorities and trade associations on the results of the Institute's examinations, 236 money prizes, placed at the disposal of the department by the Livery Companies of London, were awarded last session. It is pointed out that the offer of these prizes encourages students to take full advantage of the opportunities for instruction now afforded; and we are not surprised to learn that the competition in most subjects is very keen.

Turning to the portion of the report in which are recorded the results obtained in special subjects, we find that in the one in which our readers are most interested—"Gas Manufacture"—the number of candidates who submitted themselves for examination last session was 241, of whom 26 passed first class, 32 second class, and 26 failed in the Honours Grade, and 58 passed first class, 52 second class, and 47 failed in the Ordinary Grade—making a total of 168 passes and 73 failures, or 30·2 per cent. In the previous session, the number of candidates was 218, of whom 66 failed, or 30·3 per cent.; so that the results for the two years approximate very closely. Reporting upon the work of the students, the Examiner (Dr. Harold G. Colman) says the result was in many respects encouraging; for though the average quality of the answers was not quite up to that of the preceding year, it was very much higher than formerly. Many excellent papers were done in both grades, and very few really bad ones were sent in. Sketches were much more freely used in the answers; and the character of them showed decided improvement. There were, however, two unfavourable points which, he says, require attention. In the Ordinary Grade, there was this year an increased tendency, in a number of cases, to the "cramming" of answers learned off by heart to various questions, on the chance of their being set. The candidates, however, mostly betrayed the fact by making some slip—showing that they did not really understand the answer that they were writing. In the Honours Grade, as in previous years, the weakest answers given in most cases were those relating to the retort-house. Dr. Colman finds that the great majority of the candidates fully understand the principles of gaseous firing, but, in otherwise good papers, they frequently show that they have very little idea how to put these principles into practice, in order to obtain good and uniform heating of the retorts. He says the fault lies apparently not so much in the lack of ability on the part of the candidates, as in the fact that they do not get any real experience of retort-house working until a late period. Bearing in mind that management of heats is probably the most important point in gas manufacture, he considers that it should receive attention much earlier than is often the case; and he suggests that the matter is well worth the attention, not only of the teachers of classes on the subject, but more especially of those who are responsible for the training of the candidates in the various gas-works of the country.

We have already published the names of the successful candidates and of the prize winners at the last examinations; and in the "Journal" for the 12th of May we gave the papers set in the two grades. The programme for the examinations next year was issued by Mr. John Murray, Albemarle Street, in June; and to this all intending candidates are referred.

FURTHER AS TO THE WET STORAGE OF COAL.

We have been favoured by Mr. J. Macaulay, of Newport (Mon.), who has become celebrated as the author of the suggestion for the wet storage of coal, with a reprint of an article which he recently contributed to the "Engineer," on the Editor's invitation, by way of accounting for the observed facts on which the suggestion was based, and upon which we have already commented. The broad facts are, as stated by Mr. Macaulay from his observations of semi-bituminous coals shipped at the Alexandra Dock, Newport, that such coals, when stored under water, do not deteriorate in calorific value, as they certainly do by keeping in the air. Our observations on Mr. Macaulay's discovery, such as it is, were offered in the "Journal" for Sept. 29; and since then no communication has reached us indicating the existence of any interest in the subject on the part of shippers or users of gas coals. Yet, obviously, the matter is one of as great importance to coal carbonizers for gas making as it can be for steam coal users at home or abroad. The deterioration of gas coal by keeping is one of the traditions of gas manufacturing technique; and though no one has assigned a definite valuation to the effect in question, it has always been understood by gas managers that "weathered" coal is not so good for their purpose as coal fresh from the pit. Indeed, it has been urged as one of the recommendations of some of the largest gas-works—notably Beckton—that they enable facilities to be provided for abridging to a matter of hours the interval between the raising of the coal and its conversion into gas and residuals. Long ago, when gas-works were comparatively small, and arrangements for supplying coal were of a somewhat casual order, covered coal-stores were an essential part of the establishment. As time passed, and the works increased in size, this provision naturally diminished in scale, until at last it was considered sufficient to store coal in heaps in the open. It is safe to say, however, that no works manager would have thought of keeping his reserve of coal absolutely under water.

This is now the recommendation; and it must be admitted that Mr. Macaulay makes out a good body of reasons, based on the physical character of coal, for the observed facts. He points out that when a lump of bituminous coal is acted upon by a disintegrating heat, it opens out gently like a cauliflower. That is to say, the gases in the body of the coal expand under the influence of heat, and force the substance of the coal apart; thus offering a maximum of clean surface to the action of the heat. As the whole mass of the coal is permeated with gas passages (as can be seen in the residual coke), the expansion is uniform; and the top of a good piece of coke does very nearly resemble the appearance of a head of cauliflower. The result of storing the coal in the open air is a disturbance of the nature of the coal in both kinds, the physical and the chemical. Some amount of the contained gas goes off quickly; and the disintegrating action of sun, wind, rain, and frost steadily and ceaselessly operates on the rest—breaking it up into smaller pieces, and allowing always more of the volatile constituents of the original coal to escape. It is, indeed, unnecessary to further describe the action of weathering upon porous and brittle masses of coal. But assume that, instead of being exposed to air, the coal is kept under water. The gases in the pores of the coal are kept in. There is less oxidation, if any; and the physical effects of pressure and rolling of the lumps over one another are prevented by the presence of a cushion of water. Besides, the temperature is more equable.

Long submerged coal has a distinctively dull appearance, which, however, is very superficial. It is also brittle. Upon being taken out of the water, the coal quickly dries. That used in Mr. Macaulay's experiments, after having been under water for periods ranging from three to ten years, could not be distinguished, on the score of wetness, from ordinary coal, after lying for 36 hours under a July sun on the platforms of the locomotive sheds. Besides, coal is, as a matter of fact, already shipped and sent by rail in open trucks in all weathers. Those gas managers who during this last reputed summer and autumn were accustomed to see the rain water running out of the bottoms of the coal-trucks standing on their works sidings, can corroborate what Mr. Macaulay has to advance in this connection. The only question is: What would be the best treatment for such coals if they had to be stored for any length of time? Mr. Macaulay's answer would be: Keep them wet until wanted for use.

In the circumstances, it might be expected that a good many guesses would be made at the reasons for the observed effects of the wet storage of coal. But, apart from all hypothesis, the statement is, broadly and temperately, that coal stored for a year under water would not lose more than 3 per cent. of calorific value, whereas if stored in air in this country it would deteriorate four times as much, and in a bad climate six or eight times. In Hong Kong, navy coal is reputed to lose between 20 and 40 per cent. between storing and handling. Gas coal would appear to be likely to depreciate still more. Sir John Brunner is one of those who have interested themselves in this subject, and he has suggested that coal should be stored in a series of separate reservoirs, which could be completely emptied in turn, and would furnish reliable data. Mr. Macaulay has for the time being limited the practical application of the system to the steam coal reserves of the Royal Navy, as being the most pressing case; but, as he justly remarks, the principle applies widely to every manufacturer throughout the world who has to store coal in large or small quantities. It is greatly to be desired that the bearings of the proposition upon gas coal kept in reserve at home and abroad should be worked out; because if, as is alleged, about one-fifth of the value of air-stored coal is regularly sacrificed—to say nothing of occasionally larger losses through spontaneous combustion—so simple a remedy as that which has been disinterestedly propounded by Mr. Macaulay should not be neglected.

THE MANUFACTURE OF SULPHURIC ACID.

A well-known treatise on an important subject by a well-known scientist, is always worth careful perusal and attentive study. The first edition of the valuable treatise by Dr. Lunge on the above subject was published twenty-four years ago. A second edition appeared in 1891, but was supplemented subsequently by a copious appendix in 1896. The author modestly suggests in the preface to his new edition,* that "it might perhaps appear somewhat early to publish another edition of such a voluminous treatise." From 1896 to 1903 is seven years—a long epoch-making period for the rate at which science is progressing, and in our opinion quite sufficient to justify the author in bringing up to date our knowledge of the subject upon which he writes. Science advances, and facts accumulate in these days almost too rapidly for treatises, even on special subjects, to keep up to the most recent progress. An efficient work rapidly becomes almost effete; and the only alternative is the issue of an appendix, or of a completely new edition. The present work is entirely devoted to sulphuric acid, and comprises no less than 1214 pages, divided into two volumes. The printing is plain, and the copious illustrations are excellent. Much of the book is beyond either the scope or the requirements of those connected with even the higher class of gas-works who deal with their own residuals; but the special attention devoted to the ordinary "chamber process" of manufacturing sulphuric acid, with all its multitudinous details, and the utilization of spent oxide and of sulphuretted hydrogen for sulphuric acid production, come well within the scope of those interested in the profitable use of gas-works bye-products (so-called). The perusal and careful study of such a voluminous work as the present requires some time and attention; but we hope in next week's "Journal" to give a *résumé* of the subjects treated, with especial reference to their bearing on gas manufacture.

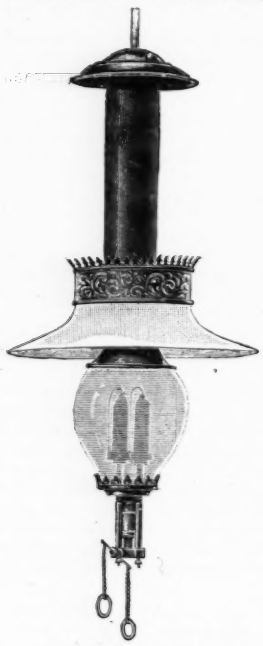
THE "WIS" HIGH-POWER LAMP.

There is no doubt that the type of high-power lamp which is self-contained has grown very much in favour among gas-lighting engineers; and therefore it is not at all astonishing that we should occasionally have to note new arrivals in this particular field. The "Wis" is the latest; but (as the illustrations show) in form and general appearance it is not greatly different from its predecessors. There can, however, be no question about this, that its designer is a practical man, who has made a study of the points which go to constitute a good lamp, not only in respect of illuminating power, but in regard to those little details that tend to preserve and to facilitate the cleaning and maintenance of the vital parts of such lamps. It is in the combination of small but extremely useful details, and in the cheapness of the lamp, that Messrs. Pond and Co., who are introducing it, believe that popularity will be secured for it. The lamps are made for interior and outside lighting, and for double or single lights. The one which we illustrate (p. 410) for inside lighting has a duplex burner; and in this type of lamp any mantle can be used. With a No. 4 mantle, and a consumption of 4½ cubic feet of gas per burner per hour, a duty equal to 45 candles per cubic foot is claimed. With long mantles (say, 5-inch ones) and a consumption of 16 or 17 cubic feet of gas, the illuminating power is placed at about 700 candles. With all the conditions favourable, and a careful adjustment of both the gas and the air supply, an equal lighting power is said to be possible with a consumption of only 15 cubic feet of gas.

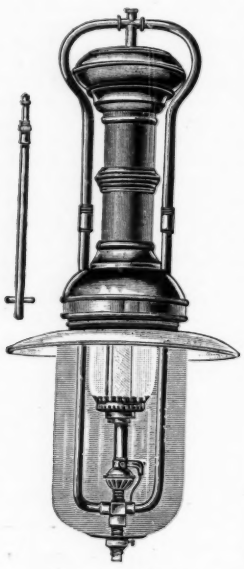
It is unnecessary to refer to the general principle of the lamp; the illustrations alone explain this. But attention may be called to some of the details on which the lamp courts favour. Still alluding to the interior lamp, the lower part of the enamelled steel chimney is made so that it can be raised and supported by a bayonet catch, for purposes of examination or cleaning. The globe carrier is also secured by a bayonet joint, which enables the globe to be readily removed. The difficulty which is sometimes experienced with the sieves at the top of the caps of the burners of high-power lamps, is said to have been completely overcome by the particular form of sieve which has been adopted in this lamp, and which is one of its features. The sieve here is composed of aluminium woven on edge, and about $\frac{1}{8}$ inch thick; and this, it is guaranteed, will outlive the lamp itself. There is also a gas-adjustment device in connection

* "A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali, with the Collateral Branches." By George Lunge, Ph.D. Vol. I., Parts 1 and 2. London: Gurney and Jackson (Successors to Mr. Van Voorst); 1903.

with the nipple; and a shutter, with an up-and-down movement, is furnished for the regulation of the air supply. Then provision is made for the cleaning of the burner in all directions. The top lifts off the stem; the removal of a little syphon plug at the base causes any condensation or dust that may have accumulated to be blown out by the force of the gas; and a little side screw gives a free-way horizontally through the lower part of the body of the duplex burner and the plug of the cock. All the parts of the lamp, even to the chains, are oxidized; and clear or obscured globes are supplied. Of course, a bye-pass can be fitted if required; and a conveniently placed regulating-screw for it is provided. The interior lamp can be used with or without a shade. With a shade, of course, there is a good downward light; and it adds to the neatness of the lamp for shop-lighting purposes.



Indoor Lamp.



Outdoor Lamp.

Nearly all the foregoing description applies to the outdoor form of the lamp. There are the same adjustments for the air and gas; the steel chimney can be raised in the same way; the upper part of the burner, globe, and mantle can be removed together for cleaning purposes; and there is also the syphon for relieving the burner of any extraneous substance. In this case, the consumption of gas is approximately 15 cubic feet; and the illuminating power is stated at 700 candles. The globe is supported by a strong screw nut at the bottom; and the short length of tube upon which this nut works forms a covering to a keyhole by means of which the gas is turned on and off. The key is shown in the illustration at the side of the lamp. This arrangement is a sure protection against any tampering with the supply of gas to the lamp. The key has a second use. It can be fixed in the keyhole; and the cross-arm at the bottom serves to support the globe when the lamp is receiving attention. It is a strong looking lamp; and the points which have been noticed are among those which, the makers contend, enable them to describe it as a "perfect" lamp.

OBITUARY.

The death occurred on the 8th inst., at The Grange, Totteridge, Herts., in his 96th year, of Sir Charles Nicholson, Bart., M.D., D.C.L., &c. Deceased was the first Australian baronet, and that country's oldest statesman. In the year 1833, when he was only 25 years of age, he landed in Australia, and not long afterwards he was associated with others in the pioneer work of introducing gas into the colony—the Australian Gaslight Company of Sydney, which was founded in 1837, being the result. Of this undertaking he was one of the original Directors, and for many years retained the position. He became a member of the first Legislative Council in New South Wales in 1884, was Speaker of the Chamber three times, and held in succession several offices of distinction and influence. He was knighted in 1852; and was created a baronet seven years later. The foundation of the great University of Sydney, of which he was for many years Chancellor, was the work with which his name has been specially associated. To the last he retained a very warm interest in everything relating to Australia. He is succeeded in the baronetcy by his son.

The late Mr. Thomas Fletcher, whose death was announced in the "Journal" for the 22nd of September, left estate valued at £28,200 gross and £27,582 net.

PERSONAL.

Sir Alfred Bateman, K.C.M.G., the Comptroller-General of the Commercial, Labour, and Statistical Department of the Board of Trade, whose name has frequently come before readers of the "Journal" in connection with the work of the Department, will shortly retire after 40 years' service. The President of the Board of Trade has appointed Mr. H. Llewellyn Smith, now Deputy-Comptroller, to be Comptroller-General.

Sir Fortescue Flannery, M.P., who was elected a Director of the Crystal Palace District Gas Company in the early part of last year, has, on the nomination of the late Lord Mayor (Sir Marcus Samuel), been added, along with two other gentlemen, to the City Lieutenancy, to supply a third of the vacancies which arose during his Lordship's mayoralty. The Deputy-Lieutenants form a Commission who collect the trophy-tax (amounting to between £4000 and £5000 a year) used for the upkeep of the City Militia.

Mr. John A. MacPherson has been appointed to succeed the late Mr. H. W. Pearson as Resident Engineer of the Bristol Water Company. Mr. MacPherson, who has for many years held the post of Chief Assistant to the Company, is well known as the author of a very useful technical work on "Water-Works Distribution," which was reviewed in the "Journal" for Jan. 22, 1901 (p. 204). He is an associate member of the Institution of Civil Engineers, and a member of the British Association of Water-Works Engineers.

On the occasion of his leaving the Maidstone Gas-Works to take the position of Superintendent of the Rochester works of the Rochester, Chatham, and Strood Gas Company, to which, as already announced in the "Journal," he was recently appointed, Mr. James W. May was made the recipient of several tokens of regard by the officials, staff, and workmen. A handsome marble timepiece was presented to him by the staff, a silver cruet-stand by the carbonizing department, and a silver-mounted oak spirit cabinet (with cut glass bottles) by the fitting and main-laying department—each present being suitably engraved. A smoking concert was held at the Bridge House Hotel to bid Mr. May farewell, and wish him every success.

Throughout the gas industry the intelligence will be received with regret that the health of Mr. James W. Helps renders it necessary that he should have a complete change and repose from work for a somewhat lengthened period. Physically he is as strong as ever, but is suffering from nervous collapse. Voluntarily, his Directors have kindly insisted on him taking three months' rest; and, in consequence, he has arranged to visit India, and will sail on the 25th inst. It will be the earnest desire of all his professional friends (as it is sincerely our own) that the voyage, change of scene, and entire removal from work will fully brace him up, and bring him home again ready and fit to continue his work at Croydon, and to take that part in the professional life of the gas industry which he has—through the willingness and capacity which are of his nature—so thoroughly made his own.

Waste of Natural Gas Supplies.—The reckless waste of the natural gas supplies of Pennsylvania, Ohio, and Indiana is one of the greatest economic crimes committed in the United States, says an American contemporary. It appears that millions upon millions of cubic feet of this fuel are not utilized at all, and other millions of feet are burnt in huge flambeaux to advertise town sites.

The International Committee on Photometry.—We have received the report of the proceedings of the above-named Committee on the occasion of their first meeting, held in Zurich last June. It has been prepared under the direction of the Committee of the Société Technique du Gaz en France, and presents, in a convenient form for reference, an account of the labours of the Photometrical Committee so far as they have proceeded. The communications of Dr. Bunte and M. E. Sainte-Claire Deville—the conspicuous features of the report—as well as the other matters which occupied the Committee, have already been fully noticed in the "Journal;" and therefore it is only necessary to mention here that a permanent record of them has been made.

Manufacture of Mixed Gases.—The Société pour l'Exploitation des Procédés de Production de Gaz Industrielle have taken out a patent for a process for the manufacture of mixed gases of various calorific powers. The coal is distilled till the greater part of the gases has been given off, and half-finished coke is left behind. This coke is then transferred to water-gas retorts, and converted into water gas by any of the usual processes. The gases thus produced can be mixed in any desired proportion. The process offers special advantages if the water gas is led into the retorts during distillation, as it then sweeps out all the hydrocarbons before they undergo decomposition—formation of graphite being thus prevented. In the water-gas retorts it is advantageous to blow in the steam at the top, withdrawing the gases at the bottom of the charge; any hydrocarbons still remaining in the half-finished coke being thus extracted. Should it be desired to reduce the calorific power of the gas, it is mixed with the carbon dioxide obtained in the Dellwik-Fleischer process; any carbon monoxide still left in this gas being utilized.

TECHNICAL RECORD.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

There was an excellent attendance at the General Meeting of the Association last Thursday, at the Hotel Cecil; and the proceedings were full of interest. The PRESIDENT (Mr. J. Tysoe, of East Greenwich) was in the chair.

The minutes of the last meeting having been taken as read, the next matter was the reception of a

REPORT ON THE NAPHTHALENE INVESTIGATION.

The HON. SECRETARY (Mr. J. W. Helps, of Croydon) said the report was only a very short, and very general, one. The naphthalene Committee and the General Committee had had this matter constantly under consideration since the last meeting; and during the past six months a lot of work had been done. But the Committee felt they were scarcely justified in making public at this juncture everything that had transpired in connection with the investigation. Therefore, they had decided not to print any reports received so far from Dr. Colman (who had been carrying on the investigation), but simply to bring the matter forward in this short and general report:—

During the past six months, the investigation into the question of naphthalene deposits has been actively carried on; and a series of tests has been made in six selected towns, in three of which no trouble from naphthalene is experienced either in the works or in the districts, while in the other three considerable difficulties are encountered. Careful inquiries have been made by Dr. Colman as to the conditions under which condensation takes place, and determinations have been made by him of the amounts of naphthalene and other compounds present in the gas, both after condensation and after complete purification; and many experiments have been made with a view of ascertaining the effect of these compounds by altering or modifying the conditions. So far, the tests appear to show that the degree of trouble experienced is not dependent alone on the amount of naphthalene contained in the gas; and in order to follow out these conclusions further, investigations are being undertaken. The results so far obtained, while promising to lead to valuable conclusions, are not yet sufficiently complete for publication. It is, however, hoped that it will be possible to report more completely to the members some time during the spring of next year.

The PRESIDENT remarked that the members had heard the report; and they would see that there was a lot of work remaining to be done in connection with the inquiry. The matter was not ripe for discussion yet on the whole of the general features; but the Committee hoped, in a short time possibly, to have something to lay before the members.

On the proposition of Mr. D. IRVING (Bristol), seconded by Mr. J. L. CHAPMAN (Harrow), the report was adopted.

THE NEW PRESIDENT AND OTHER OFFICERS.

The PRESIDENT said the next business was the election of President for the ensuing year; and the name he was about to propose for this honour was well known to them all. It was that of Mr. Douglas H. Helps. The name of Helps, which was one that in the gas profession was always well received, was coupled with all that was good and true; and it required no words from him to bring before the members his claims for the distinction that it was proposed to confer on him. It was the fashion in the present day to think that young men were the best for responsible positions. Mr. Helps was a representative of the younger members of the gas engineering profession; and he (the President) was quite satisfied that, as compared with his immediate predecessor in the chair, he would so act as to justify what was generally considered to be the proper course to adopt in promoting young men to positions such as this. He would not be satisfied to rest upon the name of Helps merely; but he (the President) was quite certain he was qualified in every respect to carve out a name for himself. In occupying the position he was convinced that he would do so with credit, and so justify his selection.

Mr. W. E. PRICE (Hampton Wick) seconded the motion, which was unanimously agreed to.

Mr. D. H. HELPS sincerely thanked the members for the honour they had done him; observing that he accepted the position of President with a deep sense of the responsibility that was coupled with it.

Mr. CHAPMAN proposed that Mr. S. Carpenter, of Dorking, be elected Vice-President for the ensuing year.

Mr. W. D. CHILD (Romford) seconded the motion, which was heartily carried.

Mr. CARPENTER having responded,

The PRESIDENT said his next duty was a pleasing one. It was to propose the re-election of their Hon. Secretary and Treasurer, Mr. J. W. Helps. They were of one mind in their opinion of Mr. Helps; and he would therefore content himself by simply proposing his re-election.

Mr. F. W. CROSS (Lea Bridge) seconded the motion, which was cordially passed.

Mr. HELPS thanked the members for this renewed proof of their confidence. He would try to do, as he had endeavoured to do in the past, his duty to the Association, and keep it where he believed it now stood, at the head of the District Associations of England.

Mr. IRVING proposed, and Mr. S. CARPENTER seconded, the election of Mr. J. Donaldson, of Tonbridge, and Mr. F. C. Taylor, of Shanklin, as members of the Committee. The proposition was adopted.

Moved by Mr. JOHN MORTON (Ashford), and seconded by Mr. J. DONALDSON, Messrs. JAMES L. Chapman and A. Dougall were re-appointed as Auditors.

NEW MEMBERS.

The HON. SECRETARY said the following names had been before the Committee, and passed as eligible for membership: Dr. H. G. Colman, of London; Mr. Percy E. Williams, of Leytonstone; and Mr. Harold Baker, of High Wycombe. Mr. Helps pointed out that Mr. Williams was an Assistant Manager; but the members would remember that the rule of the Association had been to consider as eligible Assistant Managers of works of considerable size, where practically they took charge in the absence of their chiefs.

The nominations were unanimously confirmed.

PAPERS AND DISCUSSIONS.

The remainder of the sitting was occupied by the reading and discussion of two papers. The first was by Mr. S. CARPENTER, of Dorking, and was entitled "The Economic Advantages of Working a Carburetted Water-Gas Plant in Conjunction with Coal-Gas Plant." The second was by Mr. JOHN TERRACE, of Tottenham—the title being "Other Troubles than Naphthalene." The papers, with full reports of the discussions, appear in other columns.

The PRESIDENT, at the close of the discussions, proposed a hearty vote of thanks to the readers of the papers. Their contributions had, he said, been of a very interesting character, and could not fail to benefit them all.

MR. DURKIN seconded the motion, which was heartily agreed to.

Mr. CARPENTER briefly acknowledged it on behalf of himself and Mr. Terrace.

High tea was afterwards served; and this pleasantly ended a most successful meeting.

AMERICAN GASLIGHT ASSOCIATION.

President's Address at the Annual Meeting.

As mentioned in the last number of the "JOURNAL," the President of the Association (Mr. Alten S. Miller, of Baltimore) delivered his Inaugural Address at the morning sitting on the first day of the annual meeting, at Detroit, on the 21st and 22nd ult. The text is given in the current issue of the "American Gaslight Journal."

The President began by referring to the great strike which was in progress during the annual meeting last year—a strike which, directly or indirectly, affected every person east of the Mississippi, from the Lakes to the Gulf of Mexico. The gas industry was specially influenced. On the one hand, it was almost impossible to get fuel that would make gas, while on the other, the demand for it was unprecedented—taxing the works and mains beyond all expectation. Though the coal strike of 1902 was officially at an end before the 1st of December, the scarcity of fuel was felt until June last; and the high prices growing out of the strike still remained. While anthracite coal was selling at fancy prices (some as high as $26 a ton within 200 miles of the mines), a large amount of Welsh anthracite was imported for making water gas. It was hoped that this coal would prove a satisfactory substitute for the American anthracite; but it fell far short. It would produce gas, of course, and was better than nothing; but it was not only unsatisfactory in the generators, but did not even make a good fuel for boilers. It was hard to kindle, and was difficult to keep alight. The great demand made coke almost as scarce as anthracite, and it was not always possible to substitute the former, so that it was a lasting tribute to the energy and resourcefulness of the gas industry that the supply of gas was maintained. The coal-gas manufacturers fared better than those equipped only to make water gas. But they were not free from trouble, as the demand for all fuel, and the action of the railroads in saving themselves at the expense of the shippers, made it difficult to keep supplied.

The first step to counteract such a condition of things as that brought about by the strike was, the President thought, for gas companies to increase their capacity for storage, and put in sufficient coal to last at least five or six months, or probably for a year. The old practice of carrying six or eight weeks' supply was no longer a safe one to follow; and for the security of the business, the coal-stores should be enlarged and kept full. The second step for the companies to take was to ally themselves with the reputable builders and manufacturers in each city for the purpose of preventing lawlessness, the restriction of output, and interference with non-Union labour. Labourers and mechanics were,

as a rule, good law-abiding citizens, but were too ready to listen to the voice of the demagogue. That some concerted action was necessary was shown by other events than the coal strike. The President said his hearers were all familiar with the blackmail exacted by the leaders of the Trade Unions in New York. In another city, the militia, which had been called out by the Governor, was sent home at the request of the company affected, because it was aiding the strikers in the destruction of property. These and hundreds of other cases which could be cited showed the drift towards lawlessness in which the Unions were encouraged by those whose duty it was to preserve the peace. But, disastrous as was the strike, it was not entirely without its advantages to the gas interests. Thousands of people discovered for the first time that gas was an ever-ready, cheap, and convenient fuel; and this would not be readily forgotten.

Passing on to deal with manufacturing operations, the President remarked that since the last meeting two installations of inclined retorts had been put into operation in America. The make of gas per foot of retort, on which so much depended, seemed, he said, to be sufficiently high to prove this method the cheapest for carbonizing coal, interest and depreciation included. There were in use in France and Germany machines for propelling coal at a velocity claimed to be sufficient to easily and satisfactorily charge a 20-foot retort. If this claim were made good, it would be a powerful ally for the horizontal retorts, and might bring them to the front as the most economical system. He added that some progress was being made in coke-ovens; and a contract had been recently made by a company to buy 4 million cubic feet of gas daily from this source. There was a continual evolution in design. The cheapening of cement had largely increased the use of concrete for foundations, retaining walls, engine settings, floors, &c. The use of conveyors and labour-saving machinery was increasing. More attention was being given to economy in boilers, engines, and pumps. Purifying-boxes were being deepened and enlarged; and, as a whole, the gas business was easily keeping abreast of other manufacturing industries.

Having dealt with subjects bearing upon the manufacture of gas, the President proceeded to the question of its use; and at the outset he expressed the opinion that there is more room for progress in the efficiency of lighting burners than elsewhere. The high-pressure incandescent gas-burner had, he said, an illuminating power of 40 candles for each cubic foot of gas consumed. This seemed to be high; but with an average gas having 700 British thermal units per foot, the efficiency was only 5·3 per cent. Compared with the electric arc, which had an efficiency of 27·1 per cent., this looked small. He gave the following table of the efficiencies of the sources of light in common use in support of his remarks:—

	Per Cent.
Series arc—1 watt per candle	27·10
Enclosed arc—1 4 watts per candle	19·30
Nernst lamp—1·6 ,, ,, ,,	17·00
Incandescent electric lamp—3·5 watts per candle	7·75
Incandescent gas-lamp—40 candles per foot	5·30
,, ,, 20 ,, ,, ,,	2·65
Open flame ,, ,, 5 ,, ,, ,,	0·66
Oil-lamp	0·59

This table showed, he thought, the great opportunity that existed for improvement in the efficiency of gas-burners; and, taken in conjunction with the great strides that had been made in the past few years, it should be full of encouragement to those interested in the business. The nearer one approached perfection, the less incentive there was to further effort. Therefore, on the above showing, the gas people should work much harder than the electricians.

The President next referred to what he characterized as an unfortunate and growing tendency among those responsible for the commercial part of the gas business to push the sale of lamps containing clusters of incandescent mantles in close proximity to each other. This practice, he said, was bad from almost every point of view. The fundamental principle of good lighting was violated, inasmuch as the sources of light were concentrated instead of being scattered. Economy and efficiency in operation were sacrificed, as the effective light produced from a cubic foot of gas was less than was the case when single burners were used. The only argument he had ever heard in favour of the cluster lamp was that a certain class of people whose taste had been vitiated by the use of electric arc lamps would buy the "gas arcs" when they would not buy anything else, especially as the latter could be sold slightly cheaper than a chandelier with burners and shades. As gas managers refused to sell or encourage the sale of cooking or heating appliances which they did not believe to be satisfactory and economical, were they not making a mistake in pursuing the opposite course in lighting appliances? The President thought it was better to lose a customer than to encourage the use of a lamp that in the long run could not fail to injure the gas business.

In this connection, the President thought it would be proper to refer to the movement going on in England in the direction of reducing the illuminating power of gas. The quality of coal used and other local conditions might, he said, render such action eminently proper there, but circumstances did not justify it in America. A number of experiments indicated that a reduction of one candle in the illuminating power of the average commercial gas would reduce the heating power 3 per cent. Starting with 20-candle gas, the reduction of a candle meant 5 per cent. in light and 3 per cent. in heat. Assuming that the reduction did not decrease the duty of the incandescent gas-burner, the advantage thus gained was more than set off by the loss in the open-flame burners. If, therefore, they assumed that they were selling heat alone, and not light, how many companies could afford to reduce the price 3 per cent. in order to compensate for the reduction of a candle in the illuminating power?

The President then went on to refer to the work of the Association, and urged upon members to bear in mind that connection with it carried certain obligations, and that their duties were by no means discharged by paying the fees. He referred to the difficulty experienced in obtaining papers for discussion at the annual meetings, and to the small percentage of speakers when a subject had been brought forward. He suggested that the duty of obtaining papers should be delegated to the Council of the Association, or to a Committee appointed by them. Having decided in advance upon two or three subjects for discussion, each should be allotted to three or four members, and each member receiving such an allotment should write a paper. In addition, half-a-dozen members should be asked to come prepared to discuss each subject. The President thought that by carefully selecting the members from those favouring and those opposed to a method or system, the evidence would be more conclusive than it is at present. He recommended to the consideration of the members the report presented by the Trustees of the Gas Educational Fund and the paper by Dr. Humphreys (noticed in the "JOURNAL" last week), on the work done by its means. He pointed out that this work was directly in furtherance of the object for which the Association was formed—viz., "The promotion and advancement of knowledge, scientific and practical, in all matters relating to the construction and management of gas-works, and the manufacture, distribution, and consumption of gas." The President emphasized the fact that this increase of knowledge in the end benefited every gas undertaking in the country, and that in assisting in the work each company would be advancing its own interests.

The address closed with a fitting tribute to the memories of the members who had died during the year, foremost among whom was Mr. Eugene Vanderpool, who had been connected with the Association from its organization, and had always worked to increase its efficiency and usefulness and to advance the interests of the gas industry. His influence, however, reached far beyond the gas industry; and everything with which he came in contact was thereby dignified and uplifted. The President said he need not remind those who knew the late Mr. Vanderpool that his loss was a personal bereavement; but so far as the Association were concerned, they had lost one of their best friends.

THE UTILIZATION OF GAS-WORKS PRODUCTS.

It was stated in the "JOURNAL" some time ago that the Leeds Corporation had given permission to the Chairman of the Gas Committee (Alderman Lowden) to erect, at the New Wortley Gas-Works, temporary plant for the purpose of experimenting with an invention of his for the profitable utilization of waste gas lime by making it into bricks and paving slabs. The experiments (conducted by the Manager at New Wortley, Mr. John Bond) have now been completed, with results reported to be quite satisfactory—bricks and slabs having been produced which, as shown by tests, have qualities that will make them of great utility.

From some particulars of the matter which have been recently published in the "Yorkshire Post," it appears that without the addition of any other matter, the foul gas lime can be converted into bricks and slabs by the usual methods, and then, by another process, made ready for use in a few hours. In order to show to what use they can be put, the ordinary flagging of a portion of the footpath in front of the Gas Committee's show-room, facing the Town Hall, has been removed, and some bricks and 9-inch square slabs substituted. The bricks have been placed there more with the intention of testing their durability than with the idea of using them generally for such a purpose; it being thought that the 9-inch slabs will be not only cheaper, but more suitable. It is also intended, as soon as proper appliances can be obtained, to make slabs 3 feet by 2 feet. Even if the bricks and slabs are not adopted for the main streets, it is suggested that they will serve admirably for subsidiary streets and for many other purposes. It is contended that by this process the Corporation will effect an economy in two or three ways—that they will save the amount of 2s. per ton which is at present being paid to a contractor during the greater part of the year for carting the lime away, that they may reasonably expect to make a profit on the manufacture of the bricks and slabs, and that if the Highways Committee decide to adopt them there will also be a considerable saving in this department, as the cost is much below that of the best ordinary brick, while the durability is greater. This latter statement is made after numerous tests as to the tensile and crushing strength of the bricks, absorption of water, and other qualities. Bricks in a dry state, and also others saturated with moisture, were subjected to 36° of frost, being repeatedly frozen and thawed for a period of a month; and it is stated that not the slightest flaw or fracture was found in any of them. The bricks have also been exposed to the action of sulphurous acid, to show how they would be affected by the corrosive influence of the air in large towns and cities. The report as to this test is that the bricks were found to be affected to only a very slight extent.

THE ECONOMIC ADVANTAGES OF WORKING A CARBURETTED WATER-GAS PLANT IN CONJUNCTION WITH A COAL-GAS PLANT.

By S. Carpenter, of Dorking.

[A Paper read before the Southern District Association of Gas Engineers and Managers, Nov. 12.]

In a paper read before the Incorporated Gas Institute in the year 1901, by Mr. R. Porter, of Elland, entitled "British Water-Gas Practice,"* we were forcibly reminded that, although the manufacture of carburetted water gas had been carried on for years, no facts up to date had been submitted giving particulars of experience gained after some three or four years' work. Doubtless those who were using the process were satisfied with the advantages gained by its adoption, and were not anxious to advertise it.

The introduction of carburetted water-gas plant in the writer's works was not due to the special merits of the gas itself, but to the fact that extensions had to be carried out, and it was not possible to further extend the coal-gas plant on the present site. Land was not obtainable without an appeal to Parliament; and as the time was not ripe for such a step, it was decided to erect a plant of the capacity of 150,000 feet per diem. The only space available was less than 1000 superficial feet, upon which was erected the whole of the plant—boilers, engines, blowers, and pumps being in duplicate. There is little to add to that which has already been stated on several occasions as to plant, beyond saying it was of the "Lowe" type, and has worked satisfactorily since it was put into action in the year 1899.

As coal gas for the locality was delivered into the holders at a fairly low rate, it was decided to take daily notes of the working of the carburetted water-gas plant. A specimen of the form of tabulation is given below.

It may perhaps be wise for me at this point to give particulars of the cost of the plant, or it may suggest itself to some minds that it is possible to pay too much for a good thing.

	£	s.	d.
Buildings	400	0	0
Water-gas plant, including condenser and oil-tank—boilers, engines, blowers, and pumps being in duplicate	2350	0	0
Cooling tank	90	0	0
Relief holder	855	0	0
Foundations, paving, boiler-settings, oil-pipe, and main to relief holder	253	0	0
Meter and connections	130	0	0
Total	4078	0	0

This compares very favourably with the estimated cost of £9000 for an additional retort-house and gasholder, and to which must be added the cost of presenting a Bill to Parliament and land (say) £2000; or a total of £11,000. Deducting the cost of the water-gas plant, we get a sum of £6900, which, at 5 per cent. per annum for four years, equals £1380. I have given this period because we were able to postpone the application to Parliament and expensive extensions for that time. In fact, we were able at a later date, with the help of our new friend, to send out to our consumers 150 per cent. more gas than could be stored, without, I may say, any great inconvenience to the staff, and certainly without any reduction of district pressure.

There are those present who had a very lively recollection of the expedients adopted—such as charging retorts with expensive cannel, raising the temperature of the retorts, pulling out charges before properly spent, and sacrificing make per ton or make per mouthpiece—to meet a sudden demand caused by a fog, notwithstanding the precaution of having (say) 15 or 20 per cent. of the retorts on slow fire. This, with the help of water gas, is a thing of the past. The system in vogue at the Dorking Gas-Works is that possibly in use at the majority of works using the dual plant—*i.e.*, each section of coal-gas plant is worked to its full capacity; the balance between that and the wants of the district being supplied by the water-gas plant. The daily runs are arranged, as far as possible, to be not less than 10 hours, and on consecutive days, until at least 60 hours per week have been reached. At any rate, 30 per cent. margin is reserved to meet emergencies. Although this would mean working at a disadvantage as compared with coal-gas plant, the cost of producing 17-candle power water gas has never reached that of coal gas. The present comparative costs are given below.

Cost at the Consumers' Meters, less Distribution and Management Charges.

Coal Gas.	15-Candle Power. d.	*Carburetted Water Gas.*	17-Candle Power. d.
Coal, net	9·50	Oil, 2·4 gallons	6·90
Purification	0·22	Coke and breeze	4·50
Wages	2·58	Labour	1·50
Repairs of works	3·75	Wear and tear of plant	0·25
		Wear and tear, manufacture	1·25
		Purification and water	0 25
	16·05		14·65
		Less tar	0·25
			14·40
		Add loss in distribution 6 per cent. (†)	0·63
			15·03

[Salaries are in both tables deducted.]

In referring to the tables of comparative cost, I do not think sufficient credit has been given to those works which are manufacturing water gas for the improvements in the present prices obtained for coke. I remember three months previous to the starting of our plant an offer to supply coke during the winter to a client at 11s. per ton being declined, and was told that they would place half their requirements at 10s. 6d. per ton with me if I would supply at the lower rate. When we remember that a middle man was offering this, one is led to ask, What gas company was giving away its coke? Dumping is apparently not confined to foreign countries. Now we are charging coke to water-gas manufacture at 17s. per ton, and receiving a corresponding price for sales.

The coke factor is, as you are aware, a varying one, depending on its distance from the coal supplies. Oil is not so much affected, as it is delivered at most of the ports of this country. Labour, with larger plants, may be taken at 33 per cent. less. The wear and tear at ¼d. per 1000 cubic feet may be said to be the actual cost; 1¼d. being the proportion to cover wear and tear of the other plant. In the gas-making plant, the principal portion of the wear and tear takes place in the generator, by the burning away of the blocks in the lower portion; but these may be made to last for at least 400 days by lining up that part burned away

1903.	Friday.	Saturday.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Monday.
Gas made	56	32	52	55	58	57	57	42	56
Number of runs	41	23	40	40	44	46	47	33	42
Make per run	1365	1391	1300	1375	1318	1239	1212	1272	1333
Oil meter index	125,276	125,356	125,496	125,636	125,769	125,907	126,048	126,147	126,273
Oil used (gallons)	144	80	140	140	133	138	141	99	126
Do. per 1000 (gallons)	2·5	2·5	2·6	2·5	2·3	2·4	2·4	2·3	2·2
Coke used (cwt.)	21	10	21	21	19	18	21	14	21
Do. per 1000 (lbs.)	42	35	45	43	36	35	41	37	42
Boiler fuel { coke (cwt.)	3	1½	3	3	3	3	3½	2	3
Boiler fuel { breeze (,,)	2½	1½	2½	2½	2½	2½	2	1½	2½
Do. per 100 { coke (lbs.)	6	5	6	6	6	6	6	5	6
Do. per 100 { breeze (,,)	5	5	5	5	5	5	4	4	5
Candle power	17	17	17	17	17	16	16	16	16
Carbonic acid (per cent.)	4·0	3·7	4·4	4·0	3·4	4·1	4·4	4·6	4·0
Interval between clinkering	2·26	2.27	2·25	2·25	2·25	2·25	2·24	2·27	2·25
Hours run	9·44	4·54	9·42	9·43	9·43	9·40	9·38	6·49	9·43
Make per hour	6200	6400	5000	6000	6500	6500	6300	6500	6200
Do. per 24 hours	148,800	153,600	120,000	144,000	156,000	156,000	151,000	156,000	148,800

Cost per 1000 Cubic Feet.

Oil	7·2	7·2	7·5	7·2	6·6	6·9	6·9	6·6	6·3
Coke	3·8	3·1	4·0	3·9	3·2	3·1	3·7	3·3	3·8
Boiler Fuel { coke	0·6	0·6	0 6	0·6	0·6	0·6	0·6	0·6	0·6
Boiler Fuel { breeze	0·1	0·1	0·1	0·1	0·1	0·1	0·1	0·1	0·1
Labour	1·5	1·5	1·5	1·5	1·5	1·5	1·5	1·5	1·5
Wear and tear	1·5	1·5	1·5	1·5	1·5	1·5	1·5	1·5	1·5
	14·7	14·0	15·2	14·8	13·5	13·7	14·3	13·6	13·8

* See "Journal," Vol. LXXVII., p. 1654.

† This matter was explained in the course of the discussion.

with fire cement. It is laid on in two coats, and will take a couple of men about five hours; the total cost of which does not exceed 25s. The pumps used for the purpose of circulation and cooling the water from the separator come next. This water attacks the barrels, valves, and seatings very readily; but I have found that, by using box-wood valves and by diluting the water (which is afterwards used for cooling coke), the wear and tear is reduced to a minimum. Experience since the erection of the plant has taught lessons that may be adopted in future extensions, but which scarcely come within the scope of this paper; but a daily survey of the plant when in action will keep all parts in good order.

Having arrived at a fairly reliable comparison of the cost of the two gases, we may now consider what advantages can be placed to the credit of carburetted water gas when worked in conjunction with coal-gas plants, and which cannot be obtained when coal gas alone is produced at a particular works. Perhaps the most important advantage is the rapidity with which the plant can be brought into action from the cold; four hours being sufficient to raise the heats to enable the plant to produce at its full capacity. This would not be possible in the case of coal gas in less than 36 hours. We are sometimes told it is possible, in a case of emergency, to increase the output of coal-gas sets 10 or even 15 per cent. to enable a sudden demand caused by a fog to be met. My answer to this is that retorts should always be worked at their full capacity to obtain true economy; or, in other words, the necessary temperature for the particular class of coal should always be maintained.

The better regulation of the coke production is possibly second in importance. The ideal is, of course, the complete gasification of the coal; but, failing this, there must be a price which may be called the normal, due to its value as a heating agent. It is possible for this price to be reduced by the production exceeding the demand, and thus reducing it below its proper value. Here the gasmaker has it entirely within his power to obtain the full value. An increase of 5 or 10 per cent. in the production of water gas may dispose of the surplus which is depressing the market.

Again, the ease with which the candle power can be increased or decreased to suit the particular class of coal being carbonized is not a factor to be ignored even in these days of low-candle power. Further, the question of the cost of the elimination of sulphur compounds other than sulphuretted hydrogen is receiving a great deal of attention just at present. But with an admixture of (say) 40 per cent. of carburetted water gas, these may be reduced to 20 grains per 100 cubic feet with oxide of iron purification only. Those who are under the sulphur clauses will appreciate this as compared with the trouble accompanying the elimination of this slippery compound by calcium sulphide. The improvements in the lighting effect by the incandescent system is very evident when using a mixture of (say) 30 to 40 per cent.; and I find that the consumer, although objecting in theory to the supply of water gas, is the first to add testimony to its good qualities as a lighting medium.

As these few notes are prepared with a desire to promote discussion as to the advantages, &c., of carburetted water gas, it will not perhaps be out of place to give the writer's idea of an ideal plant of the dual type which he is sanguine enough to believe will become an established fact in the near future. It is that of the vertical coal-gas retort, circular in section, enabling the heat rays to be focussed at the centre of the mass of coal; the carbonic oxide being generated in an outside producer, and admitted at varying heights and points in the retort-setting for combustion. Such a heat may then be obtained at the centre of the retort that the unspent core may become a thing of the past. At a lower level may be arranged the generator of the carburetted water-gas plant to receive such portion of coke that may be needed for the production of water gas—such quantity of oil being used that may be necessary to enrich, or otherwise, the coal gas produced. Of late, much discussion on the merits of carburetted water gas has taken place; but the gas has come to tay and assist in the working out of the problems of this life.

Discussion.

The PRESIDENT (Mr. J. Tysoe, East Greenwich) said that personally he was hardly in a position to discuss the paper, as, never having been engaged in it, he had no practical knowledge of water-gas manufacture. He occupied the safe, if somewhat undignified, position of sitting on the fence in this matter; and he trusted that the discussion might lead him to descend on one side or the other. He did not care which side it was, as he had quite an open mind on the subject; and so long as there was some safe ground to descend on, he should be glad to descend on it. They had all had an opportunity recently of reading a very admirable paper upon this subject in the technical press by one who was an undoubted authority; but the writer of the paper and many others seemed to hold the opinion that those who were believers in the faith were safe, but those who were not were—well, otherwise. (Laughter.) That was as it might be. He believed there were present disciples of the water-gas faith; and he hoped and believed there were also those who were heretics. He trusted that, between the two, they would have a lively time. There was one question he wished to ask. In the comparison of the cost of gas delivered into the holder, there was the item "net cost of coal." He did not know if this was credited with the tar and ammonia.

Mr. CARPENTER: That is so, Sir.

The PRESIDENT: The margin is very small. And coke?

Mr. CARPENTER: Yes. 17s. 8d. per ton delivered.

Mr. J. L. CHAPMAN (Harrow) remarked that, as a representative of a medium-sized works, he should like to thank Mr. Carpenter very much for the manner in which he had placed this paper before them, and for the way in which he had opened up to those who perhaps might not have a carburetted water-gas plant the benefits accruing under certain conditions. Their President had said that he was at present a heretic on the question of carburetted water gas. But no doubt the President's conditions varied very much from the conditions of many of the members who lived far away from a direct coal supply. He believed the price the President paid for coal was 12s. a ton; the price he (Mr. Chapman) paid was over 18s. 6d.

The PRESIDENT: I said I was sitting on the fence.

Mr. CHAPMAN thought, from what the President said, he was rather on the other side of the fence. However, such points as their position in regard to the coal supply should be carefully considered in any discussion of the subject. Personally, he had much to thank carburetted water gas for. Increased dividends, constant comfort, and the happiness of a gas manager were considerably helped by a carburetted water-gas plant. They had the effects of fogs (which were continually visiting those who lived round about London), and also sudden demands for gas in these days when gas fuel was so largely in vogue; and there was no doubt that these things and other conditions required to be fully weighed, in order to ascertain whether it was wise to use carburetted water gas, or coal gas alone. The paper was very illustrative to them as to how careful the consideration ought to be. Mr. Carpenter only pointed out to them the difference of 1d.; but, as he had truly stated, the question of capital expenditure ought not to be overlooked. But as far as the manufacture of the gas went, he said the saving was 1d. per 1000 cubic feet. When the price of coal was low, there was no doubt that coal gas would win; and he himself was inclined to think a man was unwise to leave coal gas making, if he had a good sale for coke and a low price for coal. But in the case of the ordinary man who lived far away from water carriage, and had to pay the present high railway rates, he was perfectly certain that dividends must be increased wherever carburetted water-gas plant was used. They knew that the price of oil did some time since go up very considerably; and, during that period, no doubt to most of them carburetted water gas did cost more than ordinary coal gas. But taking all the circumstances into account, for small or medium-sized works, he had found much greater benefits than even Mr. Carpenter had mentioned. As a rule, he thought they made carburetted water gas, at the present price of oil, for nearly 2d. per 1000 cubic feet less than coal gas. Therefore water gas was an important element with them; and it was also a point of comfort, which was something that could not be over-rated. To have all the coal-gas retorts going, and be able to make up the residue (as it were) with carburetted water gas, was a very comfortable condition.

Mr. DOUGLAS H. HELPS (Reading) said he was well acquainted with Mr. Carpenter's works, and knew how small was the space on which he had to erect his plant. At a neighbouring works, he (Mr. Helps) was certainly able to make even a greater difference in the cost between carburetted water gas and coal gas, taking the carburetted water gas at 18 or 19 candles and the coal gas at 14 candles. If they had been of the same candle power, the difference was, at the then price of oil, fully 2½d. per 1000 cubic feet. Mr. Carpenter had mentioned several of the advantages; but there were many of the collateral advantages he had not referred to. There was one thing he (Mr. Helps) claimed for carburetted water gas; and that was that it reduced the number of stopped pipes in small works where retorts were constantly being missed. Where water gas was introduced, the fact that one had a largely reduced number of stopped pipes was because the retorts were not lying idle and getting too hot. Then, again, in coal-gas works, where the purifiers, exhausters, scrubbers, and holder room had become too small, the adoption of carburetted water-gas plant indirectly largely reduced the necessity for additions, owing to the smaller amount of coal gas that was being made. There were other advantages that could be mentioned; but he would refrain from going into them further. If there were any heretics present that afternoon, he should like to hear their arguments against carburetted water gas.

Mr. S. W. DURKIN (Southampton) said he was not there to support the cause of water gas against coal gas; but so far as he could judge, there was not much gain in it if the manufacture only was concerned. He particularly rose to point out the matter of capital outlay. In his own case, they had a water-gas plant equal to 1,300,000 cubic feet per twenty-four hours; but he had to deduct from this about 300,000 cubic feet per diem for coal-gas retorts disused. In other words, on the ground where four benches of retorts formerly stood, they had now a water-gas plant capable of producing 1,300,000 cubic feet. One reason why the plant was adopted at his works was that when they went to Parliament on the last occasion, they had an extra candle put upon them. Then it became a question as to the enrichment they should use—whether it should be cannel or some hydrocarbon, or carburetted water gas. It was at last determined to put up a carburetted water-gas plant. The result of it was that it obviated building another retort-house; and consequently a very heavy capital outlay had been saved for some time to come. There was another point he should like to

mention. He did not know if Mr. Carpenter had trouble with naphthalene in his district; but he (Mr. Durkin) had recently read somewhere that carburetted water gas was a cure for naphthalene troubles in a district. Well, he was sorry to say, he had not found it so. If anyone else had, he should like to know of it, and the reason. There were certain parts of his district where the mains had been opened up, and the naphthalene cleared away. Then they went on for months before the like occurred again. But they had been using carburetted water gas now for several years, and rather a larger proportion than of coal gas, and yet the naphthalene trouble kept repeating itself in portions of the district. Before he adopted the plant, a friend of his told him that, if he thought he was going to stop the naphthalene difficulty in the district, he was much mistaken; and true enough he had found his friend was correct. Whether other managers who had been troubled with naphthalene had been freed from it after the adoption of carburetted water gas, he did not know, nor did he ever hear. If it was a cure for the trouble, it would be a very great thing. He knew there was a process which entirely eliminated the difficulty, and on a portion of his district it was at work now very satisfactorily, and had been for some years past.

Mr. E. C. Riley (Swindon) said he had had no experience of carburetted water gas, so that he was there neither as a heretic nor as a believer. He was simply an inquirer after truth. He could quite see there were advantages which to many of them would be important and valuable in the provision of a water-gas plant supplementary to the ordinary coal-gas plant. But the question upon which he would like to satisfy himself was as to the calorific value of the water gas compared with ordinary, plain coal gas. He had been referring to figures that were given by Mr. Paterson in his address to the members of the Gas Institute some time back, and had been comparing notes with him. He found, as the result, that there were considerable variations, and some doubts as to whether they could really arrive at the relative proportion between illuminating power and calorific value. This year he had been taking the calorific power and the illuminating power at the same time right through, and found that, in the range of 2 candles illuminating power, there was a variation of something like 100 British thermal units. If there was very much difference in the calorific value, of course for power purposes (this was the point that appealed to him), the water gas might not be so advantageous as the coal gas. He should be glad to know what had been the experience of those who had had the opportunity of using carburetted water gas for power purposes as compared with coal gas.

Mr. W. E. Price (Hampton Wick) did not wish for a moment to describe where he was in the policy of this matter, in the way of being a heretic or otherwise; he was rather one who was looking into matters. But there were one or two points he should certainly like to draw attention to. He was pleased to see that Mr. Carpenter had given them the relative costs of coal and carburetted water gas. For a long time, the charge had been (and he found upon research rightly) made that these costs were not given, or were rarely given. Here they had them. In the comparison, however, he did not quite follow the first table as to the cost per 1000 cubic feet. It did not seem to compare with the second table, because in the first one Mr. Carpenter appeared to have omitted purification. It was not a very important item perhaps, as he assumed, from what the author said, that he was using oxide purification. He should like to know if this was so. In the second table, the purification was charged at ¼d.; whereas, in the first table, there was no charge for purification at all.

Mr. Carpenter asked to be allowed, in order to facilitate discussion, to say that the first table was worked out each day. There was no credit taken for tar; and that just about covered the debit for purification.

Mr. Price: Therefore the totals of the two tables are not intended for comparison.

Mr. Carpenter: No; that is so.

Mr. Price (continuing) said that in these costs, when they were taken comparatively, those who were advocating carburetted water gas were surely not giving sufficient importance to the saving on the capital charges, or it appeared to him to be so since he had looked into the matter. Of course, the cost into the holder was given rightly and fairly, but was that exactly the way to look at it? If they could put up a plant making the same amount of gas as a coal-gas plant for only one-third the capital, surely the cost of that gas should be credited with the saving in interest, even though the figures given were only into the holder. It might cost as much as, or more than, coal gas into the holder; but, if interest to be paid on the capital was only one-third (unless they were going to give the consumer immediately the advantage of that), they could afford to let the water gas cost them 1d., 2d., 3d., or whatever it might be, per 1000 cubic feet more, and it would still be the cheaper gas. Upon this point, he should like those to speak who could give an opinion as to whether he was right or wrong, because he made out that this question of interest on the capital worked out to something like 2d. or 3d. per 1000 cubic feet, which made all the difference. In arguing with those who had water-gas plants to sell, one of the first things they had said to him had been, "See how you will improve your coke market." Well, he fancied they made rather too much of that. They should first ask, "Where do you live?" and then shape their remarks in accordance with the district the gas manager happened to supply. If a gas engineer lived in the middle of Devonshire, where he had no competition, then undoubtedly, if they had only half the coke to sell, they would get what price they liked for it; but the argument must not be pushed too far, because, at that rate, if they had none to sell, they ought to make a fortune. (Laughter.) In a case where water-gas plant was put anywhere near a big town—especially anywhere near London—speaking from his own personal experience, the question of any increase in the value of coke must not be considered as of any importance whatever, owing to the competition. If coke was raised by (say) 1s. a ton, then he would do less business because the "other fellow" would bring it in at 1s. per ton less. There was a remark in the paper which he presumed he had misunderstood. Mr. Carpenter said, with reference to the working of the coal-gas sets, "My answer to this is that retorts should always be worked at their full capacity to obtain true economy; or, in other words, the necessary temperature for the particular class of coal should always be maintained." He (Mr. Price) did not gather previous to this that it was ever suggested that, in retorts lying over, the temperature should be reduced, and that they should still be kept in work at the lower temperature, but rather that they should be kept under slow fire, and not used at all. With reference to the cost and probable future of oil, he thought this was a matter that required the very careful consideration of those who were thinking of going in for water gas. He had been informed that there was still more oil to come—much more than they had ever had. They were also told that instead of oil being more costly, it would very soon be much cheaper; that, though there was a combination or ring in the oil market, combinations or rings could not last for ever; and therefore the price would be lower. But the indication, for some months past, had been that the amount of oil coming from America was less than it had been—perhaps due to strikes, or to a lessened output, and therefore, unless more oil came from other countries, it seemed to him the probability was that the oil market would be rather on the up-grade than on the down-grade.

Mr. J. Paterson (Redhill) said there were one or two remarks he should like to make; but he felt rather reluctant to rise and say anything at all, seeing that he was comparatively new at water-gas manufacture, having only had actual experience at Redhill for a matter of seven or eight months. There was one point, however, that he did not think Mr. Carpenter had brought out; and it had not been brought out so far in the discussion. It was this: The paper was entitled—"The Economic Advantages of Working a Carburetted Water-Gas Plant in Conjunction with Coal-Gas Plant." What he wished to emphasize was this, that there was another point of view, and that was the economic advantages of working a coal-gas plant in conjunction with a carburetted water-gas plant. The President, as a coal gas maker, would appreciate the point. In his case, they used water gas as an enricher. Of course, they made a quantity of water gas which supplemented their coal gas; but, primarily, they used it as an enricher. And the actual effect of this was they were able to produce a greater quantity of gas per ton of coal. He had not any figures of his own, but he would take the liberty of referring to those of his predecessor in his 1902 working. The coal gas then cost in round figures, about 1s. 4d. per 1000 cubic feet, and the water gas cost 1s. 3d., omitting an odd fraction. This gave a difference for that particular year of 1d. He allowed as an estimate (he was not in a position to give definite figures, as they would be too difficult to arrive at) that an extra 300 cubic feet of gas were made out of the coal per ton, through not having to produce (owing to the subsequent enriching) such a high quality of coal gas. The additional cost of producing this 300 cubic feet would amount to about ½d. per 1000 cubic feet; so that, owing to the fact of making water gas, they were able to produce the coal gas at ½d. per 1000 cubic feet cheaper. This was one of the strongest points in favour of water gas that could he brought out. One other point. In the comparative costs delivered into the holder, they had in the carburetted water gas "Add loss in distribution 6 per cent." He did not see how that was——

Mr. Carpenter: That has been corrected to "sales." The cost of coal gas was given as 16·05d. That was sold; and the water gas at the station meter. Therefore it was corrected to that.

Mr. Paterson: The water gas is not at the holders, but at the consumers' meters?

Mr. Carpenter: That is the cost into the holder—the cost per 1000 cubic feet sold in the holder in both cases: 16·05d. for coal gas, and 15·03d. for carburetted water gas.

Mr. H. E. Jones: It should be at the consumers' meters.

Mr. G. R. Love (Guildford) said a remark that had been made by Mr. Paterson had brought him to his feet. He used water gas at Guildford; and he found the price much about the same as coal gas. His difficulty was this: While they used their water gas primarily as an enricher, how were they to maintain the enrichment all through the twenty-four hours? They must have a plant just working to the capacity of the twenty-four hours supply, or so arrange the relief holder as to supply for the whole twenty-four hours. He was with others that water gas was a great help in many ways—more especially the one that they could run out the gas without any trouble. That was very nice. But he had gone into the works in the morning, and found that the gas was of poorer illuminating power than it should be simply because the men had allowed the enricher to get behind. Therefore, unless the water gas was arranged so that they could supply through the twenty-

four hours just the quantity required to enrich the coal gas, he did not think it was the advantage that some would have it. Personally, while he found important advantages from the use of water gas, if he had to choose between putting down a water-gas and coal-gas plant, he should certainly favour the latter, because of the continuous make.

Mr. R. Bruce Anderson (London), referring to the item of oil in the comparative cost table, 6·9d. per 1000 cubic feet, said that a variation in the oil market would take the price up very considerably, because he understood that Mr. Carpenter had a rather favourable contract for oil. There seemed to be a consensus of opinion that there was only about 1d. per 1000 cubic feet saved by water gas as compared with coal gas. If they took the item of 6·9d., a small variation in the price of oil would put the aggregate above that of the coal gas, besides which any upward variations in the price of coke would act in favour of the coal gas, and adversely in the case of the water gas. There were certainly a lot of advantages that could be named in connection with water gas, but the difficulty was to get the whole of them at once; they seemed to alternate, instead of to aggregate. He was not a user of water gas, but had studied the matter with the view of knowing how to extend when necessary. He was in favour once of using water gas; but the last time he was making an extension, he determined to use coal gas. The units for water gas were too large for small works. He believed that £4000 was about the cheapest plant he could get, taking everything into account. It would be a long time before they would be able to get sufficient benefit to warrant such a large outlay of capital all at once in the case of a small gas-works, where a matter of £500 or £1000 was a very big amount. They could with coal-gas plant meet their requirements in small gas-works in a way that they could not do, so far as he knew, with water-gas plant. They must in the case of water gas spend the whole £4000 right off, and at once face the interest.

Mr. C. E. Botley (Hastings) made a few remarks in the hope that he would assist in getting the President down on the right side of the fence. The discussion, he said, had fairly threshed out the various merits of water gas; he did not think there were many demerits. It was true that in the case of several of the large companies where coal cost less for making gas than the oil would cost them, there would not be a great advantage in the manufacture of water gas, but indirectly the collateral advantages were very great. He would point out that, if the output of coke was diminished by the London Gas Companies, there would be an increase in the value all round; it would help not only themselves, but everybody else. He was badly situated at Hastings for the purchase of coal. He was in a corner of England very remote from the coal-fields, and very difficult to get direct communication; and his experience had been that, if coal was costing 20s. per ton, oil at 3d. per gallon for making water gas would be rather cheaper, independent of the collateral advantages. Another particular point was that water gas (with which he had been acquainted for a great number of years now) had an advantage in the expenditure of capital, which was a very great consideration. A few years back he was hardly pressed for keeping up the supply of gas, and the Hastings works were extremely cramped. At that time, he decided to put up a carburetted water-gas plant; and this had enabled him not only to tide over many great difficulties, but to proceed with the erection of new works quietly, and without having to go on to the market for money at whatever price they were asked to pay for it. So in this case it had helped him considerably. The price of coke, too, he might say, had been enhanced in the south-east corner of England, owing to the fact that nearly all the works were using carburetted water gas; and they believed if the South Metropolitan Company had not been rather averse to the gas, the price of coke would have been still higher. This was an advantage to the consumer, because the lower they could produce the gas, the lower they could charge him for it. In his own case, they had sold less coke every year, but they had got more money. This was the net result of using carburetted water gas in his district. Mr. Riley made some remarks as to the calorific value of the mixed gas. If they did not use an excess of carburetted water gas, the question of calorific value might be neglected. There was a loss, but not to a serious extent.

The President: What do you call an excess?

Mr. Botley: There is a deficit in the calorific value; but only to the extent of 5 or 6 per cent. In our case, we do not exceed 33⅓ per cent. of carburetted water gas; and we have no difficulty at all.

Mr. Charles Carpenter (London): Will Mr. Botley tell us what he gets for his coke?

Mr. Botley: The price is very high at present; but if we pay a high price for coal, necessarily the coke is at a high value. At the present time our price in the yard is 21s. 8d. per ton.

Mr. Carpenter: Will Mr. Botley further tell us if he thinks he would get fair value for money if he spent 21s. 8d. for a ton of coke for fuel purposes.

Mr. Botley: In the locality in which he lives, he would. I should like to further mention that, after we have bought our coal f.o.b., the cost of freightage, town dues, and delivery on to the works is 11s.—that is, beyond the cost of the coal.

Mr. H. E. Jones (London) said the question of water gas all depended on the price of oil. Before he started to put up water-gas plants at all, he went to see the Standard Oil Company, and asked them for a five years' contract, which they flatly refused to grant. This was, to his mind, a very significant refusal, because the price of oil then was about 2½d. per gallon, and was not considered particularly cheap. He therefore said to the Company: "I shall not put up any oil-gas plant." Then they said: "What length of contract will induce you to go in for the use of oil?" He said: "I must have three years certain, or a quantity certain." He got a quantity for two places which he thought he might name—Epsom and Wandsworth. This had lasted them over five years. He would not have put up water-gas plant in either of the places if he had not had the quantity he obtained. In the case of the Commercial Gas Company, they had a quantity of oil that lasted them three years. In that case they were driven to enrichment by the heavy burden put upon them. However, they made the contract last three years; and in that time he believed the plant paid for itself in the saving of cannel. They were not able to make 16-candle gas with much less than 4 per cent. of cannel; and therefore, as would be understood, this would be costly—cannel being at that time dear. He found, in his practice on the Thames, that it did not pay to use water gas under the new *régime* of 14-candle gas; but it might at a distance away from the river, where coal was handicapped by railway charges, which might come to 3s. or 4s. a ton for going a very few miles—by shifting the coal from barges into the coal-trucks, from the trucks into carts, and from these into the coal-store (laughter); there were any number of changes as compared with the simplicity and cheapness of handling material that could be pumped through a pipe for the water gas, or the "oil gas," as he preferred to call it. It was rather a "fudge" to call it so; but it sounded nicer. However, in such cases where railway charges were heavy, water gas just made all the difference; and one of his sons who was in the room could tell the meeting that he reckoned that at two places where they were some 17 or 18 miles from the Thames (apart from that which was the very salient and important matter of interest on capital, and he was quite prepared to put the saving of capital at 2½d. per 1000 cubic feet), there was a distinct saving of 2d. or 3d. per 1000 cubic feet on the production. Again, there were several collateral advantages, which had been mentioned so often that he would not go into them; but if members who were interested in them would read one of the recent issues of the "Gas Journal" [*ante*, p. 219], they would find that Mr. Glasgow told them all over again, and he himself told them two or three years ago in a paper read before the Institution of Civil Engineers. The strain in a gas-works in midwinter—when more coal was required, and often difficult to get, owing to transit, more labour was needed, and also often difficult to obtain, and when a greater quantity of coke was being turned out—made water-gas plant, owing to the facility and ready production, a valuable and useful auxiliary and concomitant of a coal-gas works, even in London. But they must bear in mind that the salient question was the price of oil, and he thought if the South Metropolitan Gas Company as suggested and many other important companies did go in for the use of oil gas, they would find the price would rise against the others who had already got their plants. Mr. Anderson had pointed out how large a fraction the oil for enrichment was of the total cost. They had only to take the 7d., and consider that it arose from the cost of two gallons or so of oil, and then put on another 1d. per gallon, and they had raised the 7d. to 9d., and had cancelled all the advantages. Another point was that he found the leakage from water gas greater than that from coal gas. The gas was not so permanent. Using it chiefly for enrichment, perhaps he had not thoroughly gasified the oil, or perhaps the plants were not fitted with sufficiently powerful condensers.

Mr. Charles Carpenter (London)—alluding to Mr. Jones's remark that if the South Metropolitan Gas Company began the use of water gas, in all probability the price of oil would go up considerably—said as Mr. Jones had mentioned that Company by name and others had done so vaguely, he (Mr. Carpenter) ventured to say one or two words on behalf of the Company. With regard to the use of carburetted water gas, he should like to say the users of it need have no apprehension on that score at present, because there was not the slightest intention on the part of the Company to go in for it. They were quite content to have what their Chairman had called "pure coal gas." As to some of the other advantages of water gas of which they had heard, he at times wondered how it was they got on so well as they did in South London, or how it was that the Engineers of the South Metropolitan Company could manage to keep things afloat at all in mid-winter. They manufactured on a large scale, and had to deal with fogs which came very suddenly; and yet, in spite of this, they managed to get along very well without the enormous advantages a water-gas plant was supposed to afford. Then with regard to labour, he had heard a good deal of the non-dependence on labour. The Company had not found any disadvantage in this respect. They had not for many years past known what it was to have labour troubles. So that "advantage" of water-gas plant would not appeal to them. There was another matter which might be of interest to the members. In the course of the last few months, he had seen one or two American Engineers who had particularly come over from different parts of the United States, and who were concerned in the running of large and important works there. He was surprised to find that their visits had almost entire reference to the putting up of large coal-gas works. With the last one who came, he (Mr. Carpenter) had a not inconsiderable chat on the subject; and he said: "Well, the fact of the matter is this.

We can get coal anywhere, but oil we cannot. We are bound hand and foot"—that was his expression, I think, or something equally descriptive—"to the Standard Oil Company. What they choose to ask we have to pay. We want to be free of that; and therefore we propose to go in much more largely for coal-gas in the future than we have done in the past." Well, that was an important fact, because the members would see that this referred to the practice in America; and were it not for the supply of oil for carburetted water gas through the Standard Oil Company of America, he believed the position with regard to the manufacture of water gas over here would be a serious one. He thought perhaps this statement might be of interest to the members. There was another point (which he had alluded to before, but would mention again), and it was this: He should like to know the extent, where water gas was largely used, of the complaints from the consumers' point of view—whether the consumers were equally satisfied with the large dose of water gas sent out in the daytime; whether they were as satisfied with their position as before, when they had a supply of regular gas sent out through the 24 hours. The members must not shut their eyes to the fact that they not only wanted to make gas with as little inconvenience and trouble as possible, but to satisfy the consumer by giving him a gas of regular composition throughout every day of the year.

Mr. Charles Hunt said he should like to supplement what had been said by previous speakers as to the price of oil being an all-important factor. He (Mr. Hunt) had occasion during the last few months to look rather closely into this matter, to ascertain not only what was the present cost to the companies using water gas, but what it had been over an average of years; and for this purpose he took from "Field's Analysis" the figures relating to the two London Companies and the most important of the Suburban Companies using water gas. He took in each case the full period during which they had been using water gas, and compared the figures with those of the South Metropolitan Gas Company (who had not been using water gas at all), as well as with those for ten years previous to the Companies commencing the use of water gas. In both cases, he found that, with one exception, the advantage was first of all with the Companies when they were not using water gas; and, secondly, in favour of the South Metropolitan Gas Company, who had never used water gas. This was brought about by the fluctuating price of oil; there being no residuals to compensate, as in the case of coal. They could hardly tell for twelve months together what the price was going to be. Who knew but what next year, or the year after, the price of oil might not be put up by the oil companies to what it was a few years ago—4d. or 5d. per gallon? There was no guarantee whatever. So long as the oil supply was in such a limited number of hands, they were practically dependent for the cost of their gas upon the will of (say) the Standard Oil Company of New York.

Mr. Carpenter, replying to the discussion, said that several of the speakers had referred to the question of locality and price. There was a great difference between the price of coal at Dorking and in London. It cost him 17s. 8d. per ton placed in front of the retorts. When they were arranging their coke contracts at the commencement of the season, competition was so keen that he might say he lost two very large contracts by 3d. per ton. But he was determined not to reduce coke lower than a certain price because he felt that coke was worth 17s. per ton for making water gas. The result was that coal gas was benefited to the extent of something like ¾d. per 1000 cubic feet. This was an item that was not to be ignored; and the coke stock was decreasing. Had he been without an oil-gas plant, the cost of coal gas would have been raised probably by about 1d. per 1000 cubic feet. Actually the average difference in cost had been 2½d. to 3d. ever since they commenced to manufacture. Just now the difference in the cost of manufacture, owing to the high price of coke, was shown by the tables as a penny; and the advantage on capital, which had been mentioned by more than one speaker, amounted in their case to about 2d. per 1000 cubic feet. As to naphthalene, he had rather a strange theory about this—that it was due to frictional condensation. They were not much troubled with naphthalene, except in places where their pipes ran through woods or shrubberies. They had a number of mansions in and around Dorking, to get to which it was necessary to run the pipes through the woods; and it was only in these particular cases, where the soil was wet, and the mains were small for the hourly passage of gas through them. It would be understood that with the introduction of cooking apparatus the hourly consumption had been increased, probably to the extent of 50 or 60 per cent., and the result was that with a larger volume of gas passing through the pipe, increased friction took place, and they got a deposit, or did get one in the pipes. What was then done was this: The old main was taken out, and a larger one put in. Where there was a 2-inch main, they put in a 3-inch one; and they had not since been troubled with naphthalene. One case occurred during the past wet summer. They had a main supplying a village some two miles from the gas-works. Just where an elm tree overhung the road, there were continually drops of water falling upon the place where the main was laid. At that particular point, they discovered a stoppage. However, he might say that, with these few qualifications, they were not troubled with naphthalene; and for many years at Dorking they had never known what it was. But when using cheap coal—such as Holmside—they were troubled a little, until they took to carburetted water gas. As to the price of oil, they were perhaps fortunate in entering into a long contract. They had no difficulty in making it; and it was running now. He ought to mention the fact that they were paying rather more for oil to-day—2⅞d.—than other people were paying (2d. to 2½d.). Regarding the fluctuations in the price of oil, it must be remembered that they got very big ones at times in the price of coal. This should not be forgotten. Respecting the calorific value of the gas, they had sometimes run up to about 50 per cent. of water gas, and had never found any difficulty with the gas-fires. He used these fires himself, and had never had the slightest trouble. While theoretically the calorific value would, in the mixture, be about 5 per cent. less, in practice they had not found the slightest difference. The whole of the town had been lighted for many years by the incandescent system; and, as the members knew, the Kern burner was very susceptible of changes. But they had not had the slightest trouble, even when they got to 50 and sometimes to 60 per cent. of carburetted water gas—in fact, owing to the brightness of the incandescent lights, the consumers were sometimes good enough to say that they were sending out good gas. (Laughter.)

Mr. Jones: Is the 2⅞d. the cost of the oil into your works?

Mr. Carpenter: That is the cost into the tank. We have a pipe-line.

OTHER TROUBLES THAN NAPHTHALENE: AN INVITATION FOR DISCUSSION.

By J. Terrace, of Tottenham.

[A Paper read before the Southern District Association of Gas Engineers and Managers, Nov. 12.]

Naphthalene may be considered, and not without reason, the greatest trouble in the manufacture and distribution of gas which the gas engineer of to-day has to contend with—affecting, as it does, the consumer as well as the manufacturer. It is such an old bugbear, too, and has baffled so many who have tried to get the better of it, that everyone is quite willing to discuss it freely in public—candidly feeling it no discredit to be one of its victims. There are, however, other troubles, small perhaps by comparison, affecting the successful manufacture of gas, which, as they only worry those who are immediately concerned in dealing with them, are not so freely discussed, and are treated with as much reserve and diffidence as if they were caused by some fault of the engineer himself. At times, this may be the case; but the writer ventures to say that, in many instances, the immunity from trouble in any particular part of the plant is not due to any peculiar arrangement in its design or subsequent working, but very often to chance circumstances. It is to some of these troubles that the writer proposes to refer briefly, not with any intention of personally imparting much (if any) information, but in the hope that those who have successfully combated similar or other troubles will be good enough to give their experience in the discussion which, he trusts, will follow.

The old adage that the dividends are made in the retort-house, while perhaps requiring some qualification to make it as true to-day as when it was written—if really true then, when gas manufacturers had practically a monopoly of public lighting—shows that carbonization has always been considered as worthy of the best attention; and surely so it is to-day. It seems strange, therefore, that troubles with choked pipes, thick tar, and pitched hydraulic mains should be heard of from certain quarters, while others claim to be perfectly free from them. The usual contention is that it is the coals or the heats that are different; and the writer must himself plead guilty to having on more than one occasion made use of this handy and time-honoured excuse, being fully convinced that such was the case. Now, there seems little doubt that the kind of coal influences the trouble in a greater or less degree; some coals being more deficient than others in light oils to keep the tar thin. But some works have no trouble at all in this direction; while others, using the same classes of coal, have. It seems reasonable, too, to suppose that the trouble may in some degree be due to the arrangement of running off the tar, as this varies considerably in different works. In some cases, the tar passes along with the gas to the end of the bench, and is then drawn off by a seal-pot; in others, it is run off below each main; and in others it is taken out of the hydraulic main as soon as formed, by the tar run-offs being connected together in groups, and run to an upright receiver sometimes called a tar-tower.

The tar run-off seems a very important point, because, should it not work properly, the tar collects in the main, forming first a tar seal and, if allowed sufficient time, one of pitch, with choked pipes, loss of gas, and all the attendant troubles. The writer believes in having the tar run-off of ample size—say, 6 inches diameter for each six mains, with a 3-inch branch to each, and allowing plenty of fall to the tar-tower. He has found this to answer well in cases where previously trouble was experienced with thick tar and choked pipes. It was, therefore, rather a surprise to him to find, on inspecting the carbonizing plant at East Greenwich with this Association in September, that the tar-pipe there was only 3 inches diameter, and to be assured that there was litttle or no trouble with thick tar. Perhaps our President or Mr. Carpenter

may have some reason to give us as to why this is so. It cannot be urged that the heats were such that no trouble might be expected, as the condition of the retorts was beyond reproach, and the charges were unquestionably well burnt off. There seemed no trouble either with the ascension pipes.

Is it possible that, in the cases where the trouble exists, the hydraulic mains are not set with sufficient care in regard to their levels, or that the dip-pipes are of slightly varying length, allowing too much pull on some of the retorts and causing furnace gases to be drawn in, which, in turn, rob the tar of its light oils and so thicken it; or is it that the South Metropolitan gas, being kept travelling at a higher rate of speed through the comparatively small pipes from good heavy charges, does not have time to drop any tar in the ascension pipes? Our President, in his address at the Spring meeting, gave a description of his method of maintaining an equal vacuum at the various hydraulic mains, by taking the gas off in the centre instead of at the ends of the bench, using an equilibrium governor; and it would be interesting to know whether he had more trouble with choked pipes before this alteration than since. To the writer, the importance of having an equal and steady vacuum in the hydraulic main is a point not usually receiving the attention it deserves.

The difficulties encountered in keeping the retort-settings at a sufficiently high and equal temperature can hardly be treated within the scope of this short paper, as, while these form a most interesting topic, the subject is such a large one, and has already, at different times, been so fully discussed, that it is not considered advisable to enter into any details, in case a discussion on it might exclude some of the other points mentioned.

Condensation is one of the processes which has of late been receiving a good deal more attention than hitherto; and those who are troubled with chokes at this point, and who have taken an interest in the recent papers by Mr. Carpenter on "Reversible Condensers," may be interested to learn of the experience at Tottenham. The condenser there is horizontal, of cast-iron pipes, 12 inches in diameter; the gas passing through twelve limbs or vertical coils (each about 485 feet long) in parallel. When first erected in 1882, it was worked as most condensers are—namely, in one direction only—and when so working was often found to be choked. In 1898, it was, by a simple disposition of valves, so arranged that the gas could be made to pass through in either direction, and the direction of working altered each week; and since then, there has been no trouble—indeed, no examination of the pipes was necessary until last year, when they were found to be absolutely clear.

Each different type of condenser seems still to have its advocates; and while it must, perhaps, be conceded that the water cooled is theoretically the best, and the only one by which a certain fixed minimum outlet temperature may be obtained, still where water is scarce, the air-cooled condenser, with a good long travel and giving plenty of wall friction, has done, and still continues to do, good work. It is not the usual practice to work the condenser under pressure; and some of those who have tried it seem to have found considerable difficulty in doing so. In connection with condensation, it might be suggested that the tar-screen, as described by Mr. Child, of Romford, is worthy of trial, as it seems to the writer that it must, by its friction, exert a powerful arresting or condensing action (if the phrase is permissible) on the heavy tars.

The description of the purification of coal gas given in the text-books reads like a delightful fairy tale, and seems so simple that one is surprised to find any difficulties arise in this part of the plant, and that so much should have been written and said on the subject. Apparently nothing could be more simple than the rotation system; the lime first of all becoming sulphided and then carbonated, driving the sulphuretted hydrogen forward to the next box. Still, the writer ventures to say that, under the sulphur clauses, some who are working this apparently ideal system (which is said to make no nuisance when the boxes are changed) have found trouble in changing the boxes only when they are properly carbonated and free from smell. Probably, for a time all seems to go well; and then it is suddenly found that the sulphur is getting higher than is comfortable, with the result that a lime-box has to be taken before the time arrives, according to the theory, on which the system is based.

It is apparent that the success of the system must, in some degree at least, depend on the proportion of sulphuretted hydrogen and carbonic acid in the crude gas; while the part that oxygen plays in the reactions, though very generally known, is not usually sufficiently realized. If the proportion exceeds 0·6 per cent. of oxygen to 1 per cent. of sulphuretted hydrogen, trouble may be expected with the sulphur compounds; and this determines the quantity of oxygen from whatever source it may be added to the gas. The writer has, however, known cases of works where, though no oxygen was added, the oxygen has greatly exceeded this amount. It may, of course, be due to the coals used being very free from sulphur; but where this is not so, the question arises, Where does this large percentage of oxygen come from? This, again, brings us back to the retort-house, for, should the dip-pipes be of unequal length, or the vacuum of such variation in the different hydraulic mains that there is a pull on some of the retorts, then, as previously stated, carbonic acid will be drawn into the gas when the retort-lid is closed; but when the lid is open during drawing and charging, air will be drawn in, and the quantity of oxygen so increased. It is therefore suggested that a daily test of the quantity of oxygen in the crude gas is not only desirable but necessary; and if the engineer has a report of this, and the quantity of sulphuretted hydrogen and carbonic acid entering his purifiers, a good idea of the efficiency of the working in the retort-house is obtained.

The difficulty of getting rid of spent lime is one that few managers are free from; and if any of the members have tried the brick-making machinery recently exploited for using spent lime and clinkers, a few remarks on their experience would doubtless be well received.

Having noticed some points connected with the coal-gas plant, it is proposed to make a few remarks on the carburetted water-gas plant, as many of those present have apparatus of this kind under their control. Comparatively speaking, the troubles attendant on working a water-gas plant are not so numerous as those in a coal-gas plant; and, discarding such points as keeping the checkers clean, hot gas and blast valves tight, and steam cocks well packed, as being so necessary to good working that they always receive attention, it seems to the writer that any remaining troubles are practically limited to the purification. The purification of carburetted water gas is not so complex as that of coal gas, as the amount of sulphur compounds other than sulphuretted hydrogen in the gas made from most oils is so small as to be generally, though not always, quite negligible; and, as only sulphuretted hydrogen must of necessity be removed, it is somewhat surprising to hear of any difficulty in this direction. In the works with which the writer is connected, no difficulty is found in extracting the sulphuretted hydrogen by oxide alone, so that strips of lead paper stand a week's test in a Referees' sulphur apparatus (passing 840 cubic feet of gas in that period); and test-strips placed in the delivered gas apparatus, with 50 per cent. of carburetted water gas, are also perfectly clean at the end of a week.

The only trouble which the writer has found in connection with purification, is the presence of tarry matter in the oxide; and those who have trouble with this may be interested in some tests which he recently had the opportunity of making. The conditions were these: Owing to a very rapid increase in the amount of gas required, and a great scarcity of water for condensing purposes, it was found to be quite impossible to reduce the gas leaving the condenser to any reasonable temperature (more especially as the water for the scrubbers is circulated hot); and even passing it through a large relief holder did not reduce the temperature nearly sufficiently, as was very plainly visible on a wet day by the cloud of steam formed from the roof of the holder by the evaporation of the rain. It was not surprising, therefore, to find tar beginning to condense on the oxide; and as time went on, and several changes were made, it was found that the boxes had to be changed much oftener than usual, and by and bye that the oil efficiency of the plant began to fall to a serious extent. It therefore became absolutely necessary that something should be done. Several samples of tarry oxide, which on being tested were found to contain on an average 10 per cent. of tar, were in turn put in a small test purifier, and carburetted water gas of a known candle power was passed through to see the effect; and the average result was a drop of 1 candle in the illuminating power.

It was then apparent where the oil efficiency suffered; but the difficulty was to know what to do to get through the winter, and until fresh condensing arrangements could be made. The oxide was becoming so wet that it took too long to revivify, and did very little work when returned to the boxes; so, having repeated the experiments with coal gas and finding a corresponding increase in the illuminating power, it was decided to place the oxide in the coal-gas purifiers to see if that would dry it at all. This it was found it effectually did; and so, by using the oxide a few times in the water-gas boxes and then putting it in the coal-gas boxes, it was found possible to get along fairly comfortably. A fresh supply of water for condensing purposes has since been obtained, and the temperature at the outlet of the condenser is kept as near 70° as possible; and no tar is now found deposited in the oxide. It may be mentioned, however, as in some degree affecting this, that from the water-gas plant to the relief holder is 260 yards, and from the relief holder to the purifiers 112 yards, and, further, that the relief holder is a fairly large one—being a two-lift holder 80 feet diameter by 38 feet total working depth; so that, besides the cooling in the condenser, the gas is subjected to considerable friction, and receives as it were a second cooling in the relief holder. Some engineers in this country have found it necessary to use small coke in the bottom of their purifiers; and it would be interesting to learn the conditions of their working as compared with the above. In America, passing the gas through scrubbers filled with shavings has been tried with good results.

The loss of illuminating power is always a serious trouble, whether it be due to a fall of temperature, storage for an extended period, or a long travel in the mains; and as a strong recommendation to the permanency of carburetted water gas, the following table [p. 419] is given to show the difference in illuminating power of the gas tested at the works at Tottenham, and at the official testing-station three miles off (tests being taken at both places each evening), since the adoption of carburetted water gas. The proportion of water gas has, during the whole of the period, been 50 per cent.

Considerable loss of illuminating power has often been experienced for a time after putting a new gasholder to work; and to obviate this when filling a new 3 million feet holder for the first time in November last, the experiment was tried of covering

the surface of the water with a thin film of oil—the crude petroleum from which carburetted water gas is manufactured being used. The air was carefully and as completely as possible expelled from the crown, and the gasholder filled with gas of about 15¾ candles; and although the gas was not turned on to the town for about three weeks, it was found to have an illuminating power of 15¼ candles.

Year.	Works.	Official Testing-Station.
1895	15·78 Candles	15 27 Candles
1896	15·62 ,,	15·12 ,,
1897	15·60 ,,	15·13 ,,
1898*	16·13 ,,	15·52 ,,
1899	16·08 ,,	15·50 ,,
1900	15·89 ,,	15·80 ,,
1901	15·86 ,,	15·79 ,,
1902	15·69 ,,	15·62 ,,

* Prescribed illuminating power altered from 14 to 15 candles.

In conclusion, it is hoped that these somewhat disjointed remarks on a few of the little troubles found by the writer, in his short experience in gas manufacture, will be deemed sufficient to suggest to some of those of riper experience some points on which to make a few remarks, which cannot fail to be of great value to the younger members of the Association.

Discussion.

The PRESIDENT (Mr. J. Tysoe) said he must congratulate Mr. Terrace on his paper. He believed it was his first venture in this direction; and he (the President) was sure the members would hope it would not be his last. Having asked that all remarks made should be brief and to the point, he said that, at one part of the paper, an allusion was made to the question of the tar-pipes at East Greenwich. The author stated that the pipes to carry off the tar were 3 inches in diameter. When that was so, it was only for a short length on the top of the retort-benches; and he must say they had no difficulty whatever in getting the tar away. Possibly this was due to the fact that they had a steam connection that was used when there was any indication of a stoppage taking place. This possibly was the solution of that. On leaving the retort-bench, the pipe was of a larger size; but even there they found a 4-inch pipe quite sufficient to carry the tar to the tar-wells a considerable distance away. Then Mr. Terrace asked whether any difference in the matter of stopped pipes had been found since taking the gas off at the centre of the beds. He (the President) had not observed that it had had any effect whatever on the question of stopped pipes. His experience was that, if they employed men especially to clean stopped pipes, they would get stopped pipes. At East Greenwich, they had no stopped-pipe men; and so there were no stopped pipes. If there should be any such thing as a stopped pipe after the charge was put into the retorts, the stokers were fetched from their lobbies to clear it; so that every time the retort was opened, they saw to it that the pipe was clean. Otherwise, a man who was not responsible for cleaning the pipe would not trouble much about it when he opened the lids. This explained their success in dealing with the stopped-pipe question; and practically they had no stopped pipes now. He could quite sympathize with Mr. Terrace in his remarks as to sulphur purification, as he (the President) occasionally had trouble himself. As the author stated, the ease with which this matter was apparently got over—from the text-book point of view—was something remarkable; but when once a little trouble came, he did not find that reference to the text-books, or any other books, did any good. The only thing to do was to leave it until it got right. (Laughter.) That was always successful in the long run.

Dr. HAROLD COLMAN (London) said there were one or two points in the paper with regard to which his own experience ran somewhat on the same lines as the author's. These had reference to the questions of the trouble in the retort-house with stopped pipes, pitched hydraulics, and again later on in the purifiers. In mentioning the trouble in the purifiers, the author pointed out that to find the source of one part of the trouble, one must go back to the retort-house; and there was no doubt that the more trouble there was expended in maintaining the seals level in the hydraulic main, and the dips of equal length, the less there would be of difficulty in all these particulars—whether of stopped pipes, pitched mains, or in the purifiers. He was not saying for a moment there were no other causes which brought about these troubles; but the level hydraulic main and the equal seal were most important, and affected all three troubles equally. Especially was this frequently noticed with the purifiers. If, as Mr. Terrace had suggested, they determined the oxygen daily, this gave them an idea, only it varied a little from time to time. They could not get it out of the gas; and he did not suppose a gas was ever met with that was free from oxygen. They could not, with a large number of joints, and with large sections of the hydraulic pipes often under vacuum, prevent a certain small proportion of air getting in; and there was no gas-works in the kingdom in which the average percentage of air in the crude gas was less than 1 per cent., and there were a great many in which it was nearer 7 or 8 per cent., or one-fifth of these quantities of oxygen, though perhaps this was quite unknown to the gas manager. The average amount of sulphuretted hydrogen would be about 1 per cent. Say, in one works they had got 0·2 per cent. of oxygen, and in another 1·2 per cent. The result was that, in the works where they had 1·2 per cent. of oxygen, the whole of the sulphide of lime that was first formed was oxidized up to other compounds; and this left no sulphide of lime to act on the carbon bisulphide, which resulted in it going forward with the gas. Again, when the purifiers, or rotation set, had been working perfectly well, and the oxygen percentage had been about right—about half that of the sulphuretted hydrogen—some over-pulling perhaps went on, the oxygen went up, the reserve of sulphide of lime was exhausted, the carbon bisulphide went forward, and the carbonic acid also drove out the carbon bisulphide which the sulphide of lime was previously absorbing. Therefore, in such circumstances, the lime purifiers made things a good deal worse than if oxide only was being used. As to the purification of water gas with oxide, the experience he had had corresponded very largely with that of Mr. Terrace—that, when the oxide was first started, no trouble was found, especially if about 1 per cent. of air was added to the gas before purification. The amount of sulphuretted hydrogen in ordinary water gas was 0·4 per cent.; and if they added 1 per cent. of air, the purifiers would last an exceedingly long period. But as time went on, the tar accumulated in the oxide; and then the percentage of air had to be increased very much above 1 per cent., to keep the boxes clean. In one respect, one would gather from the author's statement that this was largely due to the tar condensing on the oxide boxes—that it had not been sufficiently cooled previously. This, no doubt, was partly true; but, however well they cooled carburetted water gas, a considerable amount of tar fog was always left in it, as could be seen by opening the cock on the outlet of the exhauster, even when the temperature was down to 50° Fahr. This tar fog was filtered out mechanically by the purifiers, with the result that the tar in the oxide would in many cases increase at a greater rate than the sulphur—that was to say, when they tested it for the amount of sulphur and tar, it would be found that the percentage of tar was greater than the sulphur. Such oxide was, of course, unsaleable. To get efficient and economical purification, it was necessary to see that the gas before purification was thoroughly filtered from all suspended matter. Replying to a question by the President, Dr. Colman added that he intended to have mentioned that a suitable amount of oxygen to use in purification was half that of the sulphuretted hydrogen. If the sulphuretted hydrogen was 1 per cent. in the crude gas, an amount of oxygen equal to 0·5 per cent., or corresponding to 2½ per cent. of air, was a most efficient proportion.

The PRESIDENT: It is not an absolute quantity of oxygen, but the amount has reference to the sulphuretted hydrogen.

Dr. COLMAN: It is the relation of the oxygen to the sulphuretted hydrogen. If it exceeds half, then you almost invariably get poorer purifying results. It is wonderful the strong relation that can be traced between the percentage of oxygen in the crude gas and the way the purifiers are behaving. Undoubtedly, there are other causes outside this; but, in the main, this is the most important factor.

Mr. A. F. BROWNE (Vauxhall) said he should like to say, with regard to the question of stopped pipes, that he was fully in agreement with the reader of the paper and Dr. Colman as to the enormous advantage, and the great necessity, of keeping the hydraulic mains perfectly level, and having the dip-pipes equally sealed. He was fairly satisfied that, at the Vauxhall works, this point at least had been adequately provided against. Nevertheless, they did get some stopped pipes. The President had given them a startling statement with regard to this old trouble. He seemed to say that at East Greenwich his stokers had solved the old difficulty which had confronted gas engineers for so many years. That was not so at Vauxhall. They did certainly have men who were told off to do this particular work. Despite all the care one might take in the directions of keeping the hydraulic main to the proper shape and dimensions, of keeping it fed with a sufficient stream of warm or hot gas liquor, of fitting it up with suitable arrangements for drawing off the tar—notwithstanding all these things, and notwithstanding that generally one might see these arrangements working well and normally, still there were occasions when they got flushes of stopped pipes, and the tar got thick—at times almost amounting to pitch. He thought there was nothing to fall back upon but the heats. There was a point beyond which they could not go. When the heat had risen to that particular degree when the gas was dissociated, and they had a lot of free carbon going forward, this would account for all the trouble. It was, however, possible to work high heats regularly with less trouble than if the high heats were intermittent. With reference to the question of infiltration of air, they had given a great deal of time, and spent much money, at Vauxhall upon this matter, and he had asked himself whether he was right in spending so much. They had kept an hourly test going for three years. A man had been told off day and night for the mere purpose of testing once every hour to discover the quantity of oxygen in the gas. Now the writer of the paper had given the figure of 0·6 per cent. of oxygen, which was 3 per cent. of air as the amount which could be allowed for each 1 per cent. of sulphuretted hydrogen. In his experience, 500 grains of sulphuretted hydrogen, at the inlet of the lime purifiers, was about the average—say, about 0·8 per cent. If this was the case, if they could agree on this point, he should be prepared to assert that 0·6 per cent. of oxygen at the inlet was very much too much. He did not think at Vauxhall they could purify successfully if there

were that quantity. He agreed entirely with Dr. Colman on this point; but the normal quantity they found at Vauxhall was 0·3 per cent. He also agreed with Dr. Colman that there were probably no works in which they would not find oxygen, while in some they would find a great deal more than one would have thought there should be. With 0·3 per cent. (he sometimes got it lower), his purification was normal. But if it went up to 0·4 per cent. he found a little trouble; with 0·5 per cent. it was worse; and with 0·6 there was considerable difficulty. Another factor came into this. The trouble was greatly dependent on the temperature at which they were working the purifiers. This varied very largely indeed at different works. At East Greenwich, Mr. Tysoe's purifiers were comparatively exposed; while at Vauxhall they were more or less sheltered from the weather. He (Mr. Browne) thought this was one of the reasons why people had more sulphur troubles in the summer than in the winter. The temperatures all round were higher; the purifiers were more likely to be hot. At Vauxhall, in the summer time, it was not an uncommon thing for the temperatures upon the connections leaving the boxes to run up as high as 110° Fahr.; and therefore he might assume that, in the boxes themselves, it would be considerably higher. He understood Dr. Colman to say that one of the effects following upon the presence of a large amount of oxygen at the inlet of the lime purifiers was that the carbonic acid went forward.

Dr. Colman: I said the carbonic acid drove the carbon bisulphide forward.

Mr. Browne said that he had misunderstood Dr. Colman. He was hoping that he should find confirmation of a view on this matter which had been held at Vauxhall. When they had considerably more than the normal quantity of oxygen—the purifiers being at a high temperature—there was this peculiar result, that the carbonic acid began to run forward through the boxes. Now he suggested this, or threw it out as a hint. He did not know that it had appeared in their discussions before; and he should hesitate to advance it were it not that he had the confirmation of a professional chemist as to the possibility of what he was going to state—viz., that at temperatures in the lime purifiers between (say) 110° Fahr. and 120° Fahr., the oxygen would combine with sulphuretted hyrogen to make sulphurous acid. Now if this was so—it was an experiment they could all try for themselves—the sulphurous acid would expel the carbonic acid from combination with lime. Hence they got the phenomenon which had often puzzled him, of the racing forward of the carbonic acid through the lime, so that at times they were not able to hold it. They used to fall back upon the theory of "slip." That was guesswork. Why there should be more "slip" on one day than another they did not know. They took great care over preparing the lime and filling the boxes. If this was a fact (and he for one believed it to be so), it threw a good deal of light upon an obscure difficulty in sulphur purification. They could not efficiently control the sulphur compounds if they had much air at the inlet. At Vauxhall they put air into the lime purifiers—in small measured quantity, but not at the inlet. They never, if they could help it, put air into a lime purifier in the presence of carbonic acid. They put the air into the lime box into which sulphuretted hydrogen was freely passing; but, as soon as any carbonic acid was found to be entering it, the air had to be stopped at once.

Mr. Terrace said he was afraid very little reply was needed from him. The paper was prepared primarily for discussion, and that discussion, so far as it had gone, had more than come up to his expectations. But he took the liberty of ascribing part of the reason to there being no more discussion to the fact that it was late in the afternoon, and they had had a most interesting discussion on another subject. Some of the topics mentioned in his paper were sufficient in themselves for one afternoon's discussion. The President had referred to the question of choked pipes at East Greenwich. He (Mr. Terrace) had hoped to get hold of some good information which was going to do away with all the troubles of stopped pipes in the future, so far as he himself was concerned. He was, however, sorry to say that his experience did not agree with that of the President as to the effect of putting the machine men or the stokers to clean the pipes. They had tried that; and, in fact, it was their usual way of working until the pipes got too bad. But even then, he was sorry to say, they could not keep the pipes clean. They had at times, by different expedients, got over the difficulty; and it was in the light of some experiments which he had (he might say) for some years been trying, not only in the works with which he was at present connected, but in others, to overcome this difficulty that the matter was mentioned in the paper in the hope that someone would come forward with a real cure for it. Unfortunately, he was afraid, they were as far as ever from the solution of the difficulty. Mr. Brown said that unquestionably high heats affected it. This he (Mr. Terrace) quite believed, and also that variable heats—low temperatures at one time and high temperatures at another—were much worse for them than anything else. With regard to Dr. Colman's remarks, most of them he might pass without any notice at all. The only thing he mentioned was about the purification and the condensation. He (Mr. Terrace) pointed out in the paper that, besides having the gas reduced in temperature to 70° at the outlet of the condenser, it must, to a great extent, affect the quantity of tarry particles thrown down that the distance from the water-gas plant to the relief holder, and from the holder back to the purifiers, was considerably longer in their case than probably it was in some of the others. He had hoped that members who had had trouble with tarry deposits in their purifiers would have given them the benefit of information as to their conditions. This was a serious matter, and one which, he was afraid, many were only too chary of venturing their opinion upon. It was, however, only by comparing notes on such troubles as these that they could hope to find the solution of them. Mr. Browne had spoken about the quantity of oxygen entering the lime purifiers. His remarks, however, seemed to call for very little mention. He simply confirmed what he (Mr. Terrace) had already stated. In speaking of 0·6 per cent. of oxygen in the paper, he placed the limit at that. He did not say it ought to go to 0·6 per cent, but that, if it was exceeded, then trouble would be sure to ensue. Mr. Browne's experience exactly coincided with what he (Mr. Terrace) had already found in connection with this trouble. He must thank those present for the attention they had given to the paper. As the President had said, it was his first attempt, and certainly it should not be the last, if his experience of reading a paper this time was to be taken as any criterion.

Mr. F. W. Cross (Lea Bridge) asked for permission to say a word or two, as Mr. Terrace had hoped that someone would have mentioned the tarry matter in the water gas. He (Mr. Cross) had never had any experience of any tarry matter in the purifiers. He mentioned it for this reason, that they washed their gas with clean water—clean, fresh water passing through the scrubber all the day; while Mr. Terrace washed his gas with hot water, and re-circulated it.

THE OPERATION OF LARGE CARBURETTED WATER-GAS SETS.

In the notice of the proceedings at the Annual Meeting of the American Gaslight Association which appeared in the "Journal" last week, it was mentioned that Mr. W. C. Morris, of Long Island City, read a paper on the above subject. The text of the communication is given in the last issue to hand of the "American Gaslight Journal," and we take the following extracts from it.

The author begins by reminding his colleagues that during the last two or three years there have appeared in our columns several papers on the theory of water-gas processes, extensive in their consideration of factors affecting the composition of the resulting gas. In nearly all of these papers, the effect of an excess of steam is discussed at some length, and without, as he thinks, arriving at any more definite conclusion than that there is a proper rate of flow (possibly different for each type of apparatus), and that this rate is affected by the temperature of the fire. Dr. J. Kramers, for example, in his paper on "Water Gas Manufacture in Theory and Practice," after a rather lengthy consideration of the effect of an excess of steam, came to the conclusion that, in the first place, an endeavour must be made to obtain the highest possible temperature in the generator; and, secondly, that one must try to have as little as possible undecomposed steam in the gas, not only because it carries off many calories, but because it may cause the proportion of carbonic acid to rise considerably, while the heat thereby liberated is of no advantage to the generator. In their exhaustive discussion of the "Theory of the Water-Gas Process," Drs. Strache and Jahoda laid particular stress upon the rate of flow of the steam, and implied that Dr. Bunte, in his work, did not appreciate the effect that different rates of flow would have upon the resulting gas.* Dr. Strache and his collaborator expressed the opinion that, at a particular temperature, both the steam passing through undecomposed and the proportion of carbonic acid in the gas largely increase with the increase in the rate of the steam, and to a similar extent; that with a constant rate of flow of the steam, both the steam and the carbonic acid in the crude gas decrease with an increase in the temperature; and that at low temperatures the carbonic acid and steam in the crude gas can be reduced to a minimum by diminishing the rate of flow of the steam. In their summary, they tabulated the results of their investigations. Other researches, carried out by Mr. Harris, under the direction of Dr. Bunte, were also tabulated. Mr. Morris took the former figures, and retabulated them for quantities of carbonic acid of about 6 per cent., and obtained the following table:—

Rate of Flow of Steam.	Minute of Run at which Observation was Made.	Temperature of Generators.	Undecomposed Steam, Percentage of Total.	Carbonic Acid per Cent.
0·58	12	785	9·1	6·2
4·40	9	810	24·0	6·6
7·50	3	..	11·7	4·6
8 10	3	510	1·3	5·5
13 00	3	500	11·9	5 6
13·40	3	880	27·9	6·9
17 00	3	590	25·8	5·3
21·20	3	650	41·3	6·8
21·30	3	650	23·0	6·0

This tabulation shows that, with two exceptions, at the third minute of the run the carbonic acid is never in excess of 6·9 per cent., no matter what the excess of undecomposed steam may be. There does not appear to be any special relation between the

* Abstract translations of the papers referred to by the author, will be found in Vols. LXXVII., LXXIX., and LXXX. of the "Journal."

temperature and the amount of carbonic acid, nor does the rate of flow of the steam bear any definite relation to the quantity of undecomposed steam, and more particularly of carbonic acid. The author regards this as strange; for surely the temperature of the fire must, he says, have some effect upon the quantity of steam decomposed. That the rate should not have any great influence does not surprise him, as he does not see that, other than requiring an additional amount of heat to be supplied, why, up to a certain point, it should have any appreciable effect.

The researches carried out by Mr. Harris, to which reference has been made above, were tabulated as follows:—

Temperature. Deg. C.	Percentage Composition of the Gas. H.	CO.	CO_2.	Water Vapour, per Cent. Decomposed.	Undecomposed.
694	65·2	4·9	29·8	8·8	91·2
758	65·2	7·8	27·0	25·3	74·7
838	62·4	13·1	24·5	34·7	65·3
838	61·9	15·1	22·9	41·0	59·0
861	59·9	18·1	21·9	48·2	51·8
954	53·3	39·3	6·8	70·2	27·2
1010	48·8	49·7	1·5	94·0	6·0
1060	50·7	48·0	1·3	93·0	7·0
1127	50·9	48·5	0·6	99·4	0·6

Considering these results for 6 per cent. of carbonic acid, and comparing them with an average of those obtained by Drs. Strache and Jahoda, Mr. Morris obtained the following figures:—

	Temperature Deg. C.	Undecomposed Steam, per Cent.	Carbonic Acid, per Cent.
Harris	954	27·2	6·80
Strache and Jahoda	672	19·6	6·06

He points out that this comparison does not show any great agreement. Of course, the methods of obtaining the figures were as different as laboratory work is from that of the manufactory. All the same, one would, he says, expect a closer agreement. With this summary of his opening remarks, we will leave the author to speak for himself.

The frequent extensions of the plant at which I am stationed* have prevented the devotion of much time to precise observation; but in the operation of our apparatus, daily records are made covering the grosser factors influencing the running of the carburetted water-gas sets. Recently there were installed at these works eight carburetted water-gas generators of the double superheater type, having an internal diameter of 9 feet. The new sets differed in their principal dimensions from the 11-foot sets that had been previously put up, as shown below:—

		11-Foot Sets. Feet.	12-Foot Sets. Ft. In.
Generators	—Outside diameter	11	12 0
	Inside ,,	8	9 0
	Depth	7	7 0
Carburettors	—Outside diameter	11	12 0
	Inside ,,	8	9 0
	Height	16	18 8
Superheaters	—Outside diameter	11	12 0
	Inside ,,	8	9 0
	Height	22	24 3

Naturally we were interested to learn if our anticipation in regard to these large sets would be realized. We had good reason to believe that they would equal in make and economy the 11-foot sets; and it was with a great deal of impatience that we waited for the summer falling off in the demand to occur, so that we might operate the new sets by themselves and determine their capabilities.

The data were accumulated with the idea of determining the proper rate of flow of steam supply to the generators for producing the best working results. It is not always possible to maintain laboratory perfection in operating a large number of units; and when determining the conditions governing the working of apparatus, it is always well to experiment under the conditions that will exist in their every-day use. The results to be later considered were obtained under such conditions as would exist in daily practice; and no pretension is made that they are the best that could be obtained for this type of apparatus. No special precautions were taken to produce "gilt-edged" results. Each recorded test was continued until the results were characteristic of the particular conditions, and would, I believe, be reproduced upon the return thereto.

In starting a particular set of conditions, instructions were given to the head gasmaker to alter something, in exactly the same manner as is frequently necessitated by a change in the character of the fuel, oil, or other element entering into the process. As a consequence, it is not possible to state that the conditions were always precisely maintained. All the results set forth were compiled from the daily reports, and consequently do not include any unusual or special observations such as might have been made had it entered the writer's mind that he would at some later date desire to incorporate them in a paper.

In making these rough tests, there was another object besides that mentioned—a desire to demonstrate to our full satisfaction that we had not lost in economy or productive capacity by increasing the grate area over the 11-foot sets. Previous experience with one of the old 11-foot sets, in which we had enlarged the grate area and internal diameter by thinning the lining, had led us to expect at least as much from the new sets, both in fuel per 1000 cubic feet and in make per square foot of grate area.

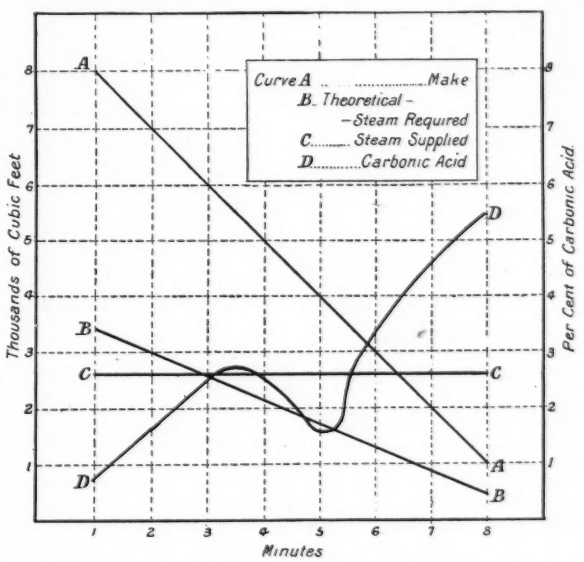
*Mr. Morris has charge of large plant which contributes materially to the supply of the Consolidated Gas Company of New York.—ED. J.G.L.

Before entering into a consideration of the results, it would probably be well to briefly describe the method of operating the sets throughout the series of tests, so that a full understanding of the tabulated data may be obtained. Each machine consists of the regular type of the United Gas Improvement Company's double superheater set, consisting of a generator, carburettor, and superheater. The apparatus is provided with mechanism for reversing the direction of the flow of gas from the generator; and to this mechanism we have attached a device for effecting, at the same time that the gas flow is reversed, a reversal in direction of flow of the steam. Before the steam enters this device, it must pass first through a globe-valve opened by the gasmaker, and then through a plug-cock set at a desired opening. This cock is provided with a pointer on the plug and a scale on the body; the position of the pointer showing on the scale the degrees that the cock is open. Between the valve and the cock there is attached a steam-gauge, showing the pressure of the steam before entering the cock. By this device the quantity of steam supplied per minute can be determined, as the cock has been calibrated for several inlet pressures and openings.

The direction of the flow of the steam through the fire-bed is reversed in each run—a part of each run being made with the steam first passing down through the fire and then finishing with the steam passing up through the fire-bed. The blows are so regulated as to produce a proper heat in the fire, and to raise the chequer brick to a temperature sufficient for fixing the oil. The fires are cleaned at the end of twelve hours, and only the ash is removed. The refuse from the fire is screened, and the small quantity of half-burned coal returned to the generators.

Curves showing the Make, Steam Required, Steam Supplied, and Carbonic Acid, for each Minute of a Run.

[The steam required was determined from an analysis of the finished gas.]



In comparing the old and new sets, I have taken the best results got from the old sets with the same kind of fuel. But in considering this, it must be borne in mind that the results were obtained in a different year, and the coal might not have been of the same character—possibly being mined from a different seam. I speak of this because the steam was in this test supplied under a different set of conditions from the best result obtained on the new sets. In all cases the actual oil results have been omitted, as they would only apply to the particular season of the year in which the tests were made. Table I. contains the data governing the conditions and the results obtained for each of the several methods of running.

In comparing the tests, it is assumed that a yield of 5·8 candles per gallon is a fair yearly average, with gas oil, for finished gas containing 3 per cent. of carbonic acid; that 1 per cent. of carbonic acid will depreciate the candle power three-fourths of a candle, or that each increase or decrease of 1 per cent. in the quantity of carbonic acid present over or below 3 per cent. would affect the oil required to the extent of 3 per cent., or would affect the cost of gas per 1000 cubic feet to the extent of 0·5 of 1 c. (the cost of oil is taken at what would seem a fair average price), the desired illuminating power being 25 candles. The amount of oil required is not entirely governed by the quantity of carbonic acid present—uniform and proper heats are necessary; and a condition that will produce this state is the most desirable. Further, the cost of 1 lb. of steam supplied to the generators would be 0·0275 c., made up of the following items:—

Boiler-room labour	0·0070 c.
Water	0·0016
Coal	0·0182
Steam to feed-pump	0·0007
Total cost	0·0275

TABLE I.—*Results on 12-Foot Carburetted Water-Gas Sets.*

Case number	A.	B.	C.	D.	E.	F.	11-Foot Sets. G.
Velocity of steam, pounds per minute	67	77	87	97	102	107	72
Steam-cock opening, degrees	75	75	75	75	75	75	67½
Steam pressure, pounds	50	60	70	80	85	90	70
Length of blow, minutes	6½	6½	7	7	7	7½	7
Length of run, ,,	8	8	8	8	8	8	8
Minutes up	3	4	4	4	4	4	4
,, down	5	4	4	4	4	4	4
Blast pressure, inches	18	18	18	18	18	18	20
Per 1000 cubic feet—							
Generator coal, pounds	33·12	36·14	33·28	33·19	32·73	34·22	33·30
,, cinders ,,	1·06	1·83	00·82	00·93	00·75	00·77	..
Steam, pounds	19·84	24·19	24·87	26·65	27·94	30·31	24·03
Per square foot of grate per hour—							
Generator coal, pounds	49·88	50·41	50·98	53·77	51·81	52·81	53·42
,, fuel ,,	51·48	52·97	52·24	55·28	53·00	54·01	53·42
Steam, pounds	29·88	33·75	38·10	43·17	44·23	46·65	38·63
Make, cubic feet	1506	1395	1532	1620	1583	1539	1608
Time between cleans, hours	12	12	12	12	12	12	12
Average time spent on cleans, minutes	72	104	75	69	62	62	69
Carbonic acid, per cent.	2·80	3	2·90	3·10	3·20	3·10	3·10
Length of test, days	7	3	5	10	10	3	5
Final condition of fires	Bad	Bad	Bad	Good	Good	Fair	Good

REMARKS.—A. Time required to clean fires increased from 65 to 90 minutes, due to increasing clinkers. B. Coal very dirty and small from much handling; thus reducing the make. C. Make generally fell off, due to increasing clinkers and increasing time required to clean fires. D. Condition generally easy to control. E. Fire soft. Otherwise conditions good. F. Condition generally good. Fires tend to become too soft, causing loss of coal when cleaning. G. Fires somewhat hard.

It is also assumed that the cost of air required by the generators may be considered constant per 1000 cubic feet of gas made, and therefore need not be taken into account; that the cost of the generator fuel is $5 per gross ton; and that the cost of the generator-house labour required and affected in the considerations is as follows:—

	Number of Sets Running at One Time.		
	Five.	Six.	Seven.
Gasmakers	10—$27	12—$32·40	13—$35·10
Stokers	6— 12	6— 12·00	6— 12·00
Coal men	4— 8	4— 8·00	4— 8·00
Ash men	4— 8	4— 8·00	4— 8·00
Per 24 hours	24—$55	26—$60·40	27—$63·10

It is further assumed that 13 million cubic feet is the desired daily make.

In regard to this last assumption, it will be seen that to accomplish this make it will be necessary to consider each case separately, and determine the number of generators necessary for producing it. Small repairs of various kinds, such as new oil sprays, &c., are required during the day, causing a small loss in the available running time of each machine. On these repairs, the gasmakers can be employed to advantage, so that any delay not exceeding (say) six hours of the total running time, would not affect the cost per 1000 directly chargeable to gas making. When the number of hours required is not more than twelve (the time needed for an even number of generators), it will be assumed that an extra generator can be run during the cleaning periods, thus not necessitating an additional gasmaker, as the time taken on cleaning with six generators amounts to at least twelve hours.

Examining each case with the view of running the least number of sets, and utilizing the gasmakers' time to the best advantage, we find that the desired quantity (13 million cubic feet) could be manufactured as follows:—

Case.	Number of Hours Running.	Number of Hours Idle.	Number of Gas Makers Required. Day.	Night.	Number of Sets Under Fire.
A	135·9	8·1	6	5	6 (Note 1.)
B	134·7	9·3	6	5	6 (Notes 1, 2.)
C	133·5	10·5	6	5	6
D	126·3	17·7	5	5	5
E	129·1	14·9	5	5	5
F	132·8	11·2	6	5	6
G	160·7	7·3	7	7	7

Note 1.—It is very probable in this and the next case that the fires would become so hard, possibly all at one time, that it would be necessary to hold extra sets under fire. This point has not been taken account of in the discussion.

Note 2.—It is hardly fair to consider this case as set forth in the test. The conditions producing the results were unusual; the coal that was used having been much handled, and very dirty. In our consideration, it has been assumed that for this case the results would be a mean between cases A and B, and that the carbonic acid would be the same as for case B, if all other conditions had been equal.

If we now tabulate from the foregoing data the costs for each case, we shall obtain a set of figures from which we can, with limitations, determine which is the most economical. This has been done in Table II.

Other factors should enter into our consideration of these figures. I have before referred to the fact that other influences affect the quantity of oil required. I have frequently noticed that, when changing from a lower to a higher rate of steam, the amount of oil required was appreciably decreased. I can only explain this in one way—viz., that the cracking is accomplished to better advantage if some steam is present, probably by preventing over-cracking. Then, again, cases A, B, and C are difficult to maintain for a long period; and it was not easy to keep the heats in the fixing-chambers uniform for these cases. The advantage of a system of running which will produce the same results day after day is of paramount importance. It cannot be stated in dollars and cents, and would not appear in our comparison of costs. In comparing the economy of the 12-foot and 11-foot sets, the difference is in favour of the larger sets. The make per square foot of grate is virtually the same.

TABLE II.—*Cost per 1000 Cubic Feet.*

[1. Generator-house labour. 2. Cost of steam. 3. Additional cost of oil. 4. Generator fuel.]

—	12-Foot Sets. A.	B.*	C.	D.	E.	F.	11-Foot Sets. G.
1	0·44385	0·44385	0·44385	0·42308	0·42308	0·44385	0·48538
2	0·54560	0·61476	0·68393	0·72288	0·76835	0·83353	0·66083
3	0·10000	0·05000	0·05000	0·05000	0·10000	0·05000	0·05000
4	7·39238	7·41024	7·42810	7·40801	7·30534	7·63790	7·43256
Total	8·28183	8·41885	8·50588	8·60397	8·59677	8·96528	8·62877

* Assumed results.

Considering the original outlay of capital, case A, if possible to maintain, would require at least seven sets; case E, six sets; and case G, eight sets. If we assume wear and tear to be covered by 15 per cent. of the original cost, we should have charges per 1000 cubic feet as follows:—

	Case A.	Case E.	Case G.
Previous cost	8·282	8·597	8·629
Wear and tear	0·420	0·360	0·401
New total	8·702	8·957	9·030

This still shows to the advantage of the larger sets. Case A is considerably lower than case E. But I am free to confess that I believe—in fact, my experience has shown—that there is not the difference in oil results indicated by the figures; other factors, such as uniform heats, &c., affecting the results to a greater degree. Still, it is more than probable that, by changing some other factor—blast, time of cleaning fires, or depth of fire bed—this low steam result could be maintained successfully.

Returning to a consideration of the effect of the rate of flow of the steam upon the quantity of carbonic acid formed, the results obtained on this type of apparatus do not agree with the claims of the writers before referred to. In our case, the mean percentage of carbonic acid is about 3, or about 5 per cent. in the blue gas. The volume of steam supplied varies from some 24 to 90 per cent. excess, with no considerable variation in the amount of carbonic acid formed; and, as stated in the early part of this paper, I consider that the temperature of the fire bed is a greater factor than the rate of flow of the steam, within reasonable limits.

The Trial of Vertical Retorts at Mariendorf.—It is noticed that in our editorial reference last week to the proposed trial installation of vertical retorts at the Mariendorf (Berlin) works of the Imperial Continental Gas Association, the name of the Engineer under whose supervision the trial is to be made is given as Mr. William Drory. Those who are acquainted with our friends bearing that well-known surname will be aware that we should have written Mr. Edward Drory; Mr. William Drory being at Frankfort-on-Main. However, we regret the slip of the pen that caused the publication of such a transparent mistake.

THE DEVELOPMENT OF CONVEYING MACHINERY.

At the Meeting of the Birmingham Association of Mechanical Engineers on the 7th inst., Mr. ARCHIBALD J. S. B. LITTLE read a paper on the development of conveying machinery, dealing in turn with its use in the boiler-house, in connection with gas-producing plants, and in gas-works.

The object of engineering is, primarily, the adoption and working of machinery for carrying on industrial operations, with a minimum of physical exertion to the operatives, a maximum of output, and no reduction in the quality. Conveying machinery is of comparatively recent origin, and the designs employed up to within the last few years are, doubtless, known and appreciated by you; so I intend in this paper to describe the gradual advance through progressive changes, touching only lightly on the old designs, but making a complete survey of the modern.

Starting with power-producing plants, I propose to deal with the conveyors handling coal and ashes—taking as examples some of the latest boiler-houses in which steam is raised for operating electric generating sets, and also one or two plants in which producer gas is the motive power. In the first case, the object is to take the fuel from trucks, carts, or barges, and locate the same to overhead storage hoppers, from which it gravitates through subtruded weighing or measuring appliances to the stokers. After being burnt in the furnaces, the ash is carried away, and stored for quick loading to carts or trucks. On the old plants, the installation consisted in most cases of a sunk steel hopper, situated at the end of the boiler-house, made to hold about 5 tons of coal, and feed the same gradually through a controlled outlet to the boot of an elevator, and from there it had to be picked up by small buckets mounted on an endless chain, which passed round wheels at the top and the bottom, and, in going over the top ones, dumped the coal down a shoot into a separate conveyor. This was of the scraper design, which consists of an endless chain with plates about 18 in. by 6 in., mounted thereon at 2-feet pitch, and propelled along a trough, which allows the coal to drop through several outlets into the hoppers. Sometimes on small plants a screw or belt conveyor would be substituted for the scraper; but the general arrangement did not vary. The capacity per hour seldom exceeded 25 tons, and the speed of working was anything from 60 to 180 feet per minute, absorbing about 0·013 to 0·012 horse power per foot-ton-hour.

The coal and ash plants were then quite distinct; and the latter were specially designed to obviate attrition on the steel plates. The usual conveyor consisted of an endless chain with over-lapping carrying plates, supported on rollers running in bearings fixed to the framework at 3-feet pitch. The ashes had to be drawn, slaked, and then shovelled on to the travelling trays, which dumped over the end wheels into a separate elevator, arranged to load a hopper. The plates were $\frac{3}{16}$-inch thick, 18 inches wide; and the chain 9-inch pitch, of malleable cast iron. The speed of working was 60 feet per minute; the capacity, 15 tons per hour; and the power, 1 horse for every 30 feet. The conveyor generally passed through the end of the boiler-house and dumped into the boot of an ordinary cased elevator.

When large unit power houses became necessary at electric lighting and tramway stations, the mechanical problems involved had to receive attention, owing to the large quantities to be handled; and the result has been a complete deviation from old methods of transport. The coal is brought to the works in trucks, and bottom or end doors are opened to pass the fuel into an underground hopper, below which the conveyor passes. This consists of two rows of chain made of double steel links 12-inch pitch, connected to each other by 1-inch rods, 2 feet apart, and supported by cast-iron rollers on light section rails. Intermediate pins are used to form, along with the cross-bars, carriers for these rollers, and also serve as swivel pins for the buckets.

Before proceeding to a detailed description, it is advisable to point out the great variation between the arrangement of this and the old style of boiler-house plant. Here one conveyor takes care of both coal and ash, though at different times; but as the ash does not come along in such quantities as the coal, it is a simple matter to arrange for the coal storing to be stopped while the ash-handling operations are going on.

Only two sizes, in two styles, of gravity bucket conveyors are made in this country. In the one style, there is a space between each bucket, and a filler is used to prevent spilling. The other is made with buckets overlapping, which arrangement dispenses with the revolving filler. The two sizes in each have buckets which hold respectively, 1 and 2 cwt. of coal; and, as the speed is 50 feet or 25 buckets per minute, the capacity of the one size is about 75 tons, and the other 150 tons per hour. You will agree that on the old stations such capacities would have been altogether out of proportion to the daily consumption; but on the large new power houses, these rates of handling are common. In practice, 50 or 100 tons is the amount carried and stored. In these conveyors, the swivel-pins are $1\frac{1}{4}$ inches in diameter; and they take the brackets bolted to the sides of each bucket. These brackets have at the bottom a $\frac{5}{8}$-inch pin to carry a roller, which comes into operation when the cams are tipping the buckets, as, no matter through what angle the conveyor works, the buckets hang with their bottoms down, and mechanical means have to be employed to tip them.

Keeping the design of the conveyor in mind, you will now be able to follow the run of buckets round the boiler-house. Under the hopper there is an automatic revolving filler about 4 feet in diameter. This loads each bucket as it passes underneath; and there can be no spilling, as the coal which is fed into the filler through a hole in the side can escape only at one of several outlets at a time, and as these, being on the periphery, are closed by the bucket underneath, and as each bucket will take only its prearranged quantity, no overloading can take place. If the conveyor and the filler are stopped, the flow of coal is also delayed. The short horizontal run of conveyor is necessary, as the filler will not feed coal to a conveyor when working on the incline or vertical. Wheels on the right divert the run, and are allowed to revolve, so that, when the rollers in the chain engage with the flange of wheels there is practically no loss of power through friction. Similar wheels are put at each corner of the building. The vertical portion is guided by rails and is entirely enclosed by weather-tight steel casing, as is also the top horizontal part outside the house.

I may mention that just after passing round the top corner wheels, there is a set of tipping-gear, which dumps the ashes from buckets down a shoot to the hopper; and just beyond this again is a continuous recording weighing-machine, which registers the gross and tare simultaneously as the buckets pass on their way to the coal-store. Every properly equipped boiler-house should have some means of automatically checking and recording the total amount of coal stored, and also the separate quantities daily used on each boiler.

A drawing exhibited by the author showed that each of the three conveyors has a top horizontal run of about 104 feet, and that it is carried on rails fixed to cast-iron brackets, bolted to 10 in. by 6 in. longitudinal joists, which are fixed to the roof principals. Besides the one for the ash, there are eight tripping cams for upsetting the coal from the buckets into the large coal-pockets. On the down vertical run, there is a loop in which the extra pair of wheels act as drivers, and receive motion through machine-cut steel wheels from a 12-horse power motor.

I will conclude the run of the conveyor and description of this plant by taking you along by the ash-trench, in which there are two shoots from each boiler to hold and, when required, direct the ashes to the travelling filler; and as this is, in principle, similar to that under the coal-hopper, one description will suffice for the two. There is a carriage mounted on wheels, and carrying the bearings and shoot. In the former revolves a shaft, on which is mounted a drum, receiving motion from the conveyor chains by means of a sprocket wheel, while the shoot is fixed to the carriage, and passes into the body of the filler, which revolves round it. The ashes or coal being fed into the shoot find their way to the body of the drum, and can escape through the several holes in the periphery one at a time. Underneath these, the buckets pass; and as the mouths of these fit round the lips on the drum, spilling cannot possibly take place. The filler can be moved right along the trench to take the ashes from any of the shoots.

Perhaps a few figures relating to this plant will be of interest; and I will take the most important first—that is the cost. One run of conveyor, which would be enough for an ordinary power station, and including all wheels, supports, hoppers, shoots, filler, and motor, but no brickwork, would cost from £1200 to £1500. It would handle 100 tons of coal per hour, and, besides, load the ashes into trucks. The cost of labour only would be from 0·48d. to 0·68d. per ton, and power required to drive about 0·0033 horse per foot-ton-hour, or, in other words, 2-horse power will convey 100 tons 60 feet every hour. This will no doubt strike you as exceedingly low; but it is the result of actual tests.

At a number of works, power-gas plants are being installed. At steel-works, gas-producers have been erected for heating purposes. Up to within the last year or two, the former were of small capacity; and if a system of coal-conveying machinery was put in, it was very small, and only handled about 10 tons per hour—the ashes being taken out by barrow. But, recently, large schemes have been contemplated, and are now nearing completion, in which more extensive transport arrangements are required. The smaller units with (say) four producers, are practically all built on the same principle, in which coal brought in carts or trucks is dumped into a hopper, and fed automatically to the elevator, which is about 62 feet long, erected on a slight angle, and arranged to feed an 18-inch diameter screw or a push-plate conveyor, which is provided with two outlets to the hoppers over each producer. In some cases, measuring-boxes are built on to the hoppers. An electric motor is erected on the head of the elevator structure, and drives through three sets of cut gearing direct on to the elevator-top shaft; a drive to the conveyor being arranged by a chain from one of the intermediate shafts. The cost of the complete plant, with the exception of the producers, is about £450. On a larger plant, with eight producers in a row, the gravity bucket conveyor can be used; the return strand passing under the producer ash pits, or, if bad ground is found, it can be brought nearer the surface by shifting its line of run to one side. For ordinary work, this design of plant is hardly suitable, as equally good work can be done by separate coal and ash conveyors at a lower capital cost.

The other producer plants mentioned are, in nearly every case, of very large capacity. The one I am about to describe was put down four years ago; and it is the largest completely automatic producer plant in the country. In this case, hydraulic power is

used for tipping the incoming waggons (a ram engaging the axle), and a truck can be emptied in this manner in about seven minutes. Under the ground, there is a steel hopper which holds 20 tons of coal, and is provided with a travelling bottom, which is really the top strand of a 36-inch wide steel belt conveyor, which is used for drawing away the coal in regular quantities—the amount being varied by a sliding door at the end. Delivery is made on to a shaking screen having 5-inch square holes, through which the small coal passes, while the large is shot over the end into a two-roll crusher; the two kinds meeting under the crusher in the elevator-boot. This elevator has 30-inch buckets, which can lift 80 tons of coal per hour to the several conveyors. The arrangement of conveyors admits of coal being carried to cross push-plates, which run over three rows of producers, and feed the continuous hoppers, under which 5 cwt. measuring-chambers are fixed, and made to discharge direct into the bell-mouth of the producer. There is no ash-handling plant, as there is a line of rails alongside the producers at a lower level, so that ashes can be shovelled direct to the railway trucks. On some large plants, of similar construction, conveyors for handling the ashes have been in use for a number of years; and a great saving in labour-cost has resulted.

I must now ask your attention to some rather difficult problems which have been successfully solved. In all cases, where gritty materials have to be handled, great care must be exercised in selecting the type of conveyor to be used; and where the material is also hot, the difficulties are exceedingly complex. It will occur to you that a case in point is found in every gas-works and coke-oven plant, where large quantities of coke have to be taken away in regular amounts every day, but in varying quantities at different times of the year. In such works, the call for labour is not at all regular. One of the serious questions presented to the managers is the means of employing coke-wheelers in other duties during the slack season; or, if the men have to be suspended, then a worse problem is the obtaining of a sufficient number of suitable men when working at full capacity, and, as engineers would say, with all belts on the small driving pulleys. At a gas-works where inclined retorts are in use, each time one of these is discharged there is a 6½ cwt. load of incandescent coke to be taken away; and in an ordinary sized works about twelve retorts will be drawn in quick succession. So that it is evident that, if automatic transport arrangements can be adopted, there will be great improvements.

First, there is the quicker operating of the retorts; and this ensures high heats with a low fuel consumption, as, if the mouthpieces are left open long, there is a big loss which has to be made up if the next charge is to be properly burnt off. Then there is the lightening of the men's work, which is, in any case, severe, and the reduction in the number of hands, making the wages bill less. A charge of 3½d. per ton for taking the coke out of the retort-house only is not considered high with hand labour; but with conveyors this can easily be reduced to 0·9d. The conveyor can, of course, be adopted in a horizontal retort-house; and where power charging and drawing machines are used, the advantages of quick automatic transport are apparent, as it enables the operative to get much quicker work out of the machines.

A recent installation is the plant at the Ipswich Gas-Works, in which the old style of coke-conveyor was adopted. There are two conveyors which deliver into a cross transporter, which stacks the coke in the yard, and can also feed a fourth conveyor. This also deposits over the yard, and can, in addition, feed two crushers delivering to screens, which take out the breeze and deliver it to a small storage hopper, the tailings going to 40-ton hoppers. Two hydraulic motors of 13-horse power (47 revolutions per minute) are used for driving the whole plant. A somewhat different arrangement of conveyors has recently been started at the Saltley Gas-Works—not only the most extensive of its kind, but, what is of greater importance, it is admitted by visitors and users to be the best thing in coke-conveyors ever put into use. The plant has a capacity of 582 tons per 24 hours; and it takes the hot coke away right from the retorts, quenching it in transit, and delivering it into a large hopper, to be finally lifted by the Goliath crane for loading to trucks or barges. The two engines, which are of local manufacture, are each capable of driving the whole plant, so that one is kept stationary when the other is working. The load on each engine does not exceed 40-horse power. Since the installation has been started, I have taken out further patents for this class of conveyor which greatly simplify the arrangement, and reduce the number of working parts. The cardinal points of a conveyor for handling gritty materials are: The employment of all-steel bushed chain; over-lapping carrying plates, with the supporting rollers attached thereto, and made to run on a rigid steel framework; and, finally, a large capacity at moderate speed. All these are apparent in the Saltley conveyor; and the reason of their adoption is easily explained.

[Having given this outline of examples of recent inventions, and shown how they have been successfully applied, the author indicated, by the aid of diagrams, the gradual progress made with automatic transporters, which has made possible the carrying out of various large industrial operations, which would not have been possible without the aid of the conveyor expert. He enabled his audience to follow the evolution of the screw conveyor from the time of Archimedes to the present year.]

THE "VOLONTA" PENDANT.

A very happy hit in the design of a useful and ornamental gas-pendant has been made by Messrs. E. J. Shaw and Co., of Walsall, in the type they have named the "Volonta," an illustration of one of many forms of which is given. By several gas engineers who have obtained samples, it is highly spoken of; and in show-rooms it certainly makes an attractive feature, especially when fitted with a group of three or five inverted burners. The patent embodies an adaptation of a principle previously, so far as we are aware, unapplied to gas lighting, and by which means the light can be raised or lowered within well-defined limits. The range, however, is sufficient to cover all requirements whether for domestic or for church or public hall lighting. The rising and falling motion is secured by using a flexible steel tube, which is wound round a pulley, placed immediately below the ceiling rose; the flexible tubing winding on or off the pulley according to whether the pendant is raised or lowered. There is a counter-weight to adjust the balance. The gas is admitted to the burner first down the arms which carry the pulley, then into the axle of the pulley, and from the axle into a chamber which forms its centre. From this central chamber the gas passes into the flexible steel tubing and on to the burner.

The system of construction places no limit to the number of designs which can be produced. The chief feature, apart from the utility of this pendant, is its elegance and slenderness. Whatever may be the character of decoration adopted in a room, the electric light effect of the "Volonta" pendant accords with all styles of furnishing. The pendant is made for ordinary "C" burners as well as for the inverted burner. In a room a pendant fitted with three or five inverted burners has a very striking decorative effect. For public buildings, the "Volonta" will also recommend itself—not only for its simplicity, but by reason of the fact that it can be drawn down and lit and raised into its place with the least possible trouble. The noiseless and non-vibratory movement which attends the raising and lowering of the burner is a noticeable feature.

TESTS OF INCANDESCENT MANTLES AND BURNERS.

Our readers may remember that at the close of the paper on the "Variations in the Lighting Power in the Incandescent Burner of Combustible Gases," which M. E. Sainte-Claire Deville presented to the International Photometric Committee, on the occasion of their first meeting, held at Zurich in June, an abstract translation of which has been given in the "JOURNAL,"* he stated that tests of mantles, with the view of ascertaining their durability, &c., were very desirable; but he left to others more competent than he considered himself to be, the study of the methods by which these qualities were to be determined. He nevertheless has not entirely relinquished his interest in the investigation on which he had been engaged, for the current issue of the "Journal de l'Éclairage au Gaz" contains the results of two experiments with mantles and burners which are published by him by way of postscript to his paper. We give them below.

I.—*Comparison of an Auer, a Thorine, and a Cerite Mantle.*

A trial was made, with progressively increased consumption of gas, with each of the above-named mantles; the supply of air being regulated for the maximum illuminating power compatible with the quantity of gas burnt. Coal gas of rather poor quality (4830 calories) was employed; and the following figures show its maximum useful effect:—

	Auer.	Thorine.	Cerite.
Consumption of gas, litres	216·00	232 00	208·00
,, ,, heat, calories	1043·00	1120·00	1004·00
Absolute intensity, carcels	18·75	6·77	1·07
Intensity per 100 litres of gas, carcels.	8·67	2·92	0·51
,, ,, 1000 calories ,,	17·95	6·04	1·07
Proportion of air at the base of the bunsen burner	4·70	4·66	5·23

The light given by the Auer mantle was white, as was also that of the thorine mantle; while the cerite mantle gave a very feeble red light. With regard to the thorine mantle, however slightly the proportion of air was diminished or increased, the effect was shown in the light, which became blue-green in the

* See Vol. LXXXIII., pp. 499, 567, 617.

former case and red in the latter. This observation is supported by the following figures, obtained with a consumption of about 260 litres of gas:—

	Insufficiency of Air. Blue-Green Light.	Proper Proportion of Air. White Light.	Excess of Air. Red Light.
Consumption of gas, litres. . .	261·40 ..	260·00 ..	260·00
Absolute intensity, carcels. . .	5·22 ..	6·82 ..	5·22
Proportion of air.	4·10 ..	4·70 ..	5·23

The comparative results of the trials of the three mantles may be interpreted as follows: The proportion of air which cannot be exceeded without encountering the phenomenon of dissociation is the same in the cases of the Auer and pure thorine mantles. These two mantles are therefore at the same temperature. If the Auer mantle gives more light, it owes it to the presence of cerite—a body which at this temperature has a spectrum richer in luminous rays than that of thorine. With regard to the pure cerite mantle, it cannot be heated owing to the enormous calorific radiation of cerite, which, as well demonstrated by M. Charles Féry, acts as a black body. This mantle cools the flame to the extent of nullifying almost all dissociation, and rendering possible nearly complete combustion of the gas. But if ceria could be brought to the temperature of the thorine mantle and maintained there, its enormous calorific radiation would be transformed into luminous rays. It is precisely this condition that is realized in the Auer burner. The thorium oxide which forms the bulk of this mantle stores up the heat, to immediately relinquish it, by contact or convection, to the cerite. Thus the latter is maintained at the temperature at which its intense radiation is manifested as luminous rays. It may be said that the function of the thorine is to keep the cerite hot. These experiments consequently lead us to adopt the theory of incandescence given by M. Féry, in the paper he published towards the close of last year in the "Annales de Chimie et de Physique (Vol. XXVII.).

II.—*Experiments showing the Effect of Various Degrees of Admixture of Gases on the Action of Incandescent Burners.*

Many people attach to the intimate mixing of the air and gas an importance which always seemed to the author to be exaggerated. He considers that the mixture formed naturally in a laboratory bunsen burner is sufficiently homogeneous. In proof of this, all that is needed is to carefully examine the flames issuing from the twelve lateral orifices of the small crown placed on the ordinary bunsen. These flames are all absolutely identical. They constitute, in a way, twelve samples of the gaseous mixture formed in the tube; and if the homogeneity of this mixture were not perfect on reaching the perforated crown, some of the flames richer in air would *ipso facto* have a different appearance. This, however, is not the case.

To clearly demonstrate that results obtained with incandescent burners depend solely on the percentage composition of the gaseous mixture, and cannot be influenced by an asserted defect of intimate admixture, three series of two comparative trials were made with gradually increased quantities of gas. In the first of the two experiments, the above-mentioned air-fed burner was employed; in the other, the straight bunsen tube was replaced by one of similar length and diameter, at the base of which was a mixing chamber consisting of a cylindro-conical cavity with four wire gauze diaphragms, with a very small space between them. These gauzes formed baffle-plates; and if the mixture of gas was not homogeneous on its entrance into the chamber, one was justified in supposing that it was so at its exit. The following are the averages of results obtained in both cases for the maximum luminous intensity on the basis of 1000 calories: With mixing chamber, 18·37 carcels; with ordinary bunsen tube, 18·57 carcels. It may therefore be concluded, in view of the close approximation of these figures, that the mixing chamber is simply a useless complication.

A NEW ILLUMINATING MATERIAL.

In a recently issued volume of United States Consular Reports, the Consul-General in Munich (Mr. James H. Worman) directed attention to an important discovery of an illuminating material by Herr Hermann Blau, the well-known German chemist. His method is to separate, by a process of rectification, the methane and hydrogen from the other constituents of oil gas, collecting the same in steel receivers subject to a pressure of 40 atmospheres, whereby he converts it into liquid form. A comparison of the cost of the various illuminating materials is shown in a table drawn up by Fischer in his "Chemical Manual" (1900).

Per 100 Heat Units.	Cost. Pfennige.	Pence.
With petroleum burners—		
Flat	13·2 ..	1·58
Round	7·3 ..	0·87
With incandescent alcohol . . .	9·1 ..	1·09
With coal gas	4·5 ..	0·54
With electricity	27·3 ..	3·27
With acetylene	9 to 16 ..	1·1 to 1·9

With the liquid gas made according to Blau's method, the cost is reduced to 6·3 pfennige (0·78d.), including freight. As seen from the above table, this new illuminating material compares very favourably in cost with all others. Mr. Worman says the ease with which it can be handled and the beauty of its light should make it preferable where a lighting material is wanted as a substitute for petroleum, alcohol, or acetylene. As Blau's light is much more easily turned on or off, it is certainly more convenient. Its low cost and its beautiful colour may give it preference even over the electric light. It is thought that it will undoubtedly open a new field of industry.

On Dec. 24, 1902, a trial was made for the first time to produce the liquid gas; and it showed how practical and very simple the process of preparation was. It has since been decided to erect an oil-gas furnace, and to reconstruct the rectifying apparatus in accordance with the practical observations obtained by the experiments referred to.

A new test has recently been made, and it shows a marked improvement and a remarkable productive power in every respect. It was also found that, by the addition of a considerable amount of tar, which is in no way detrimental, a beautiful yellow colour was given to the gas. A test-tube filled with the gas needed only the warmth of the hand to cause it to effervesce. It also effervesced when poured upon a metallic plate and on to water. In the latter case, a crust of ice was formed. Its odour is pyroligneous aromatic. The concentration amounted to 537 grammes instead of 550 grammes per litre under a pressure of 40 atmospheres. The specific gravity, when in a gaseous state, was 1·26 (taking air at 1); the absolute weight, 1·03. The trial which resulted so satisfactorily was carried out in the Holshaeuerschen Maschinenfabrik of Bavaria, the owners of which are now supporting the project.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Depreciation of Corporation Electrical Undertakings.

Sir,—In the "Journal" for Nov. 10 there are two articles upon which I would like to make a few remarks. The first is on p. 347, entitled "Depreciation on Municipal Electricity Supply Plants;" the other is on p. 349, where there is a paragraph (under "Electric Lighting Memoranda") dealing with the Edinburgh electric lighting accounts. In the first article, Glasgow, Aberdeen, and Bolton are commended because they allow for "depreciation" on their electric lighting undertakings; and in the other article, Edinburgh is mildly censured for not "providing against the antiquation of the plant," and for not following Glasgow and Aberdeen "in regard to depreciation."

If the writer of the second article had gone into the matter himself—instead of taking his facts and figures from the "Municipal Journal" and the "Electrician"—he would have seen that, although "that blessed word" depreciation is not mentioned in the Edinburgh accounts, the financial position is quite as strong as in the cities named. I will compare Glasgow and Edinburgh, and allow your readers to judge.

The Glasgow electric lighting undertaking was opened in 1893; and the total capital expenditure at May 31 last was £1,041,745. Of this sum, there has been repaid, through the operation of the sinking fund, £49,693; and written off in the form of depreciation, £96,172—making a total laid aside out of revenue of £145,865, less the deficit on last year's accounts, £13,895. The net sum of £131,969 was thus put aside during the ten years' working, with a total capital expenditure of £1,041,745.

The Edinburgh undertaking was opened in 1895; and up to May 15 last, £800,710 had been expended upon it. There has been paid up through the operation of the sinking fund, £114,285; there has been placed to reserve (which may be called depreciation if one chooses), £41,967; and there has been paid out of revenue for some antiquated plant, £1994. This makes a total laid aside out of revenue equal to £158,247. I do not include the sum of £11,000 paid to the general improvement scheme from the electric lighting revenue, although no corresponding contribution appears in the Glasgow accounts. We have thus Glasgow, with £1,041,745 of capital, working for ten years, laying aside £131,969; while Edinburgh, with a capital of £800,710, working for eight years, lays aside £158,247.

Do not these figures show very conclusively that, instead of Edinburgh being asked to follow Glasgow, it should be the other way about? But this is not all; for it should not be forgotten that in Glasgow a large portion of the original plant has been scrapped, and the sum of £96,172 has been written off largely because of this. The Glasgow Committee is composed of very capable business men; and they are surely right in not keeping on the books a fictitious value on plant which no longer exists. In Edinburgh, no such necessity has yet arisen, except to the very trifling extent of £1994—the value of certain "rectifiers" no longer required. This was repaid to capital out of last year's revenue.

It has always seemed to me that writers on depreciation of municipal undertakings do not discriminate between municipalities which differ so largely in the rate at which the capital is paid up. For instance, Glasgow with a capital of over a million sunk in electric lighting, only contributed last year to the sinking fund the sum of £13,924; while Edinburgh, with a capital of £240,000 less, contributed £27,431—very nearly double Glasgow's contribution.

I have not seen the full accounts of the Aberdeen and Bolton electric lighting undertakings, but judging from the tables of the "Electrical Times," Aberdeen pays to the sinking fund about 1¾ per cent. per annum of the loans, and Bolton at least 3½ per cent. Glasgow apparently is content with something like 1 per cent. (I believe all future loans in Glasgow are to be paid up in a shorter time).

It is perfectly evident that the writer of the first article referred to was not aware of the difference in sinking fund contributions, when

contrasting the various undertakings in reference to depreciation, which profoundly affects the financial position.

May I add that the writer of the "Memoranda" may set his mind at rest in regard to the charge made in Edinburgh for public lighting and for motor power. Those who are managing the concern know what they are doing; and after studying the figures given above as to the financial position, I think he must admit that Edinburgh does set a good example to other cities. But if he can point out any electric lighting undertaking showing better results, I have no doubt the capital of Scotland will not be too proud to follow.

A. Donald Mackenzie,
Chairman of the Edinburgh Electric Lighting Committee.

Edinburgh, Nov. 12, 1903.

Culinary Methods and the Production of Smoke.—At the meeting of the Court of Common Council of the City of London on Thursday, a letter was received from the City of Westminster, enclosing a copy of the following resolution, passed on the 22nd ult., and asking the support of the Corporation in the matter: "That, in view of the damage to health and property caused by coal smoke, the London County Council be urged to undertake an inquiry into all the methods of cooking, so as to ascertain whether there is any form of apparatus which is smokeless, and at the same time practical and economical for general use." The letter was referred to the Sanitary Committee.

New Joint-Stock Companies.—The Coke Syndicate, Limited, has been registered with a capital of £1200, in 1s. shares, to acquire the benefit of certain inventions for the manufacture of coke, ammonia, tar, and gas from coal dust, coal, and other carbonaceous matter; to adopt an agreement with R. Pearson; and to carry on the business of coke and gas manufacturers, coal and coke merchants, &c. The Electro Peat-Coal Syndicate, Limited, has been registered with a capital of £500, in £1 shares, to carry on the business of manufacturers of peat fuel, peat charcoal, and fibrous peat, wherein the raw material is subjected to the influence of electric current, with or without the addition of minerals or chemicals, &c.

The Belfast Coal Contracts.—At the last meeting of the Belfast County Borough Council, the coal tenders, which, as mentioned last week, have caused some unpleasantness in the Gas and Electric Committee, were under discussion. A long report on the subject had been received from Mr. James Stelfox, the Gas Engineer, whose Secretary had been to London to consult him thereon. After considerable discussion, it was decided to order from the Hulton Colliery Company, Limited, 20,000 tons of coal, at 14s. 3d. per ton; from Messrs. W. M. Barkley and Sons, 30,000 tons, at 14s. per ton; from the Eveson Coal and Coke Company, 40,000 tons, at 14s. 1d. per ton; and from Messrs. Thrutchley and Co., Limited, 15,000 tons, at 14s. 2d.—making 105,000 tons in all. Mr. Stelfox had gone into the matter most carefully, considering the state of his health, and the Committee were quite satisfied at his expression of opinion in regard to the quality of the coal they were about to order.

MISCELLANEOUS NEWS.

INCANDESCENT GAS LIGHTING IN LONDON.

Further Extension to City Side Streets.

At the Meeting of the Court of Common Council on Thursday, the Chairman of the Streets Committee (Mr. A. C. Morton) brought up a report recommending that new gas-lamps, fitted with incandescent burners, should be fixed in four districts of the City specified, together with Philpot Lane, and the side streets, courts, and alleys in the Broad Streets and Aldgate Wards. Some time ago, it may be remembered, the Ward of Farringdon Without—the largest in the City—was lighted by incandescent gas; and the results of the experiment led the Committee to decide to light the remainder of the side streets on this system. On the reception of the report,

Mr. Painter drew attention to the report prepared by Mr. Bradley, the City Engineer of Westminster (see *ante*, p. 350), which, he said, showed that incandescent electric lighting was better and cheaper than gas; and he moved, as an amendment, that the question be referred back to the Committee for further consideration.

Mr. White remarked that the light given by electric lamps was not to be compared with gas.

Mr. B. Turner said the Corporation had been experimenting for fourteen years with the question of lighting the side streets, and they had found gas to be cheaper, and capable of giving a far better light, than electricity. He hoped the Council would pass the report, as it was quite time the matter was settled.

Mr. A. J. Hollington pointed out that during the fourteen years the Corporation had been discussing the matter, electricity had made rapid strides. As they had only recently obtained the information from Westminster, he thought they should postpone consideration of the Committee's report.

Mr. Morton said it was useless to refer the report back to the Committee. He was under the impression that the policy of lighting the side streets of the City by gas was settled by the Committee some twelve months ago, when it was decided that incandescent gas was better than electric lighting. He had seen the Westminster Engineer's report, but it only referred to the main streets; and if it proved anything at all, it certainly proved that with electricity they did not get the light they paid for. They were told, when they adopted electric lighting, that they were going to get 2000-candle power with each arc light; but the Westminster report showed that they could not get more than 590-candle power out of any arc light. Incandescent gas and electric arc lighting had been put into competition at Ludgate Circus, and there they found the verdict was in favour of incandescent gas supplied under pressure, especially when the cost was so very much less. Owing to the experiments which the Corporation were making, the matter had been delayed for a good many years. There was no

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doubt that the lighting of the side streets in the past had been disgraceful, and the citizens had called their attention to it time after time. They had already fixed 1000 incandescent lamps in the City, and had wholly lighted the large and populous Ward of Farringdon Without—giving every satisfaction, as shown by the thanks which had been accorded at the wardmote. These new lamps did not cost more than the old ones, and gave not less than four times the amount of light. He hoped the Court would not allow the matter to be delayed any longer. The Corporation had not been quite satisfied with the condition of the mantles; and they had now made arrangements with the Gaslight and Coke Company whereby the mantles would be kept in at least as good order as those in the hands of the South Metropolitan Gas Company. The Committee were very anxious to give the citizens a light which should be as good as that provided in any parish in London; and the only effect of referring back the report would be to postpone this. The citizens were satisfied with the experiments carried out, and now the Committee were ready to give them more light at the same expense.

The report was then agreed to.

GAS-WORKS RESULTS AT OSSETT.

At the Annual Meeting of the Ossett Town Council on Monday of last week, Alderman Audsley, the Chairman of the Gas Committee, gave some interesting particulars in regard to the working of the gas undertaking. During the past year, he said, they had fixed 1077 new meters in houses that had never been supplied with gas before. The Manager (Mr. A. E. Mottram) was now making 11,012 cubic feet of gas per ton of coal, as against 9990 feet a year ago; and they were using the same coal. They carbonized about 8000 tons of coal a year; and this meant, taking the gas to be worth 2s. 6d. per 1000 cubic feet, £1000 a year to the Corporation in the more economical working of the gas plant. When the works were taken over in 1901, they were only producing 9273 feet of gas per ton; so that they were now making 1739 feet more. This improvement had been brought about by the resetting of the retort-beds. In place of eight beds of sevens, which gave 112 mouthpieces, they had now six beds of eights, giving 96 mouthpieces. In the greater economy of working, they made more gas; while at the same time they used less coal, and it required less coke with which to get up the requisite heat—the saving in coke being a decrease of from 28 per cent. to 15 per cent. In addition to effecting this saving, there would be more coke to sell. In 1901, they were selling 7668 cubic feet of gas per ton of coal; but at the present time they were selling 10,170 cubic feet—a gain of 2500 feet per ton of coal carbonized. These improvements were the results of good management, the more economical system now in vogue, and the erection of better retorts on the regenerative system, as against open firing. This extra 2500 cubic feet of gas would mean a saving of £2500 per year; and this was a matter upon which the Committee might congratulate themselves. They saw what was being done in other towns; and they thought that, the old retorts and the retort-house being worked out, they would adopt the best possible system. The Manager had prepared the plans, and superintended the whole of the construction; and the work was carried out in a most satisfactory manner by Messrs. Drakes, of Halifax. Moreover, there was not a single dispute between the Contractors and the Committee. Great praise was due to the Manager for the successful completion of the work. If they looked at their printed minutes, they would find that during the two years and four months that the Corporation had had the gas-works they had supplied 1723 new meters. They could not expect during the next year, or for a few years to come, to make such rapid strides; but having now installed the most economical method of producing gas, and with all these new customers, he thought they might look forward to the works doing very well, both for the town and for the consumers. They would probably get straight in a short time; and then in a year or two, they might perhaps be able to give some concession to the consumers. They had reduced the leakage from 16 to 10 per cent.; and this meant a saving of at least 5 million feet of gas, at £125 per million, which gave a total saving of £625 a year that would otherwise have vanished into the air. They could not have gone on with the old system, because they had a large sum of money to raise for the repayment of principal and interest. There was £1600 a year to go to the sinking fund for the purpose of paying off the debt; but they must not forget that in the meantime they were gradually making the works their own property, and he believed that soon the consumers would be able to buy gas as cheaply as those in any other town.

ALLEGED OPENING OF A TENDER AT WARRINGTON.

At the last Meeting of the Warrington Town Council, a considerable amount of discussion took place with regard to the alleged opening of a tender for slack by the Water Engineer (Mr. James Deas). At the outset, Mr. Lord asked the Chairman of the Water Committee (Alderman Francomb) the following seven questions, of which he had given due notice: (1) Is it not a fact that Messrs. R. Evans and Co.'s tender was opened two or three days prior to the time fixed for the Water Committee to open and consider tenders for slack for Winwick and Delph Lane for a period of six months from October to March next? (2) Is it not a fact that the tender was addressed to the Chairman of the Water Committee, and endorsed "Tender for Slack?" (3) Who opened the tender, and what authority had he for so doing? (4) Is it not a fact that the tender was returned to Messrs. R. Evans and Co.'s local office, with the original envelope cut open, with a request to re-envelope and re-address? (5) Who returned this opened tender to Messrs. R. Evans and Co.'s local office, and by whose authority

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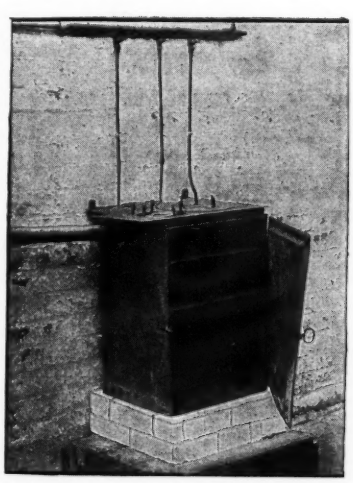

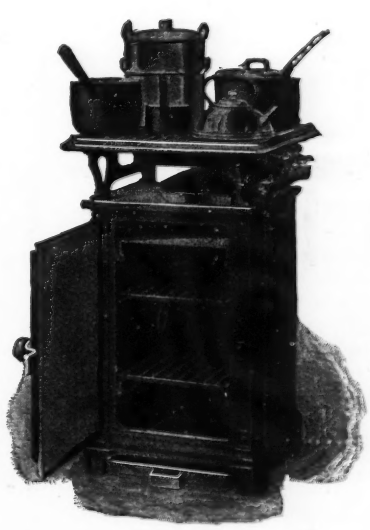

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was it returned? (6) Was the Chairman made acquainted with the fact that this irregularity had taken place, and was it mentioned to the Committee when the tenders were opened and considered? (7) What were the prices contained in Messrs. R. Evans and Co.'s tender, and the accepted tender of the Warrington Slate Company, Limited? Alderman Francomb answered these questions as follows: (1) Yes. (2) Yes. (3) Mr. Deas opened the tender, and he had no authority to do so; but he says he did it inadvertently. (4) Yes. Mr. Deas says the envelope was only slightly cut, and the cut was so small that no one could possibly take from the envelope the letter it contained. (5) Mr. Deas returned the opened tender to Messrs. Evans's local office by one of the clerks. He had no authority from anyone to do so. (6) To that I say "No." The Chairman knew nothing about the matter until some days after the contract was settled; and the information came from Mr. George, the Secretary of Messrs. Evans and Co., of Haydock Collieries. I have no recollection of it being mentioned at the meeting when the tenders were opened. (7) Messrs. Evans's price was 9s. 1d. per ton, and the Slate Company's 9s. per ton. Alderman Francomb read an explanation by Mr. Deas, in which he said that the tender of Messrs. R. Evans and Co. was addressed to the Chairman of the Water Committee and properly endorsed, and was received by him (Mr. Deas) with other letters on the Saturday morning previous to the meeting of the Committee on the Monday. The envelope containing the tender was partially opened by him inadvertently, but not sufficiently for the tender to be taken out. The mistake was at once discovered; and, as a matter of fact, the tender was not taken out of the envelope, or seen by anyone. He immediately sent one of his clerks to Messrs. R. Evans and Co.'s local agent explaining the circumstances, and requesting that the tender should be put in another envelope and returned, which was done. Mr. Deas added that he did not think it necessary to bring the matter specially under the notice of the Chairman or Committee. Two of the clerks in the Water Office also declared that they saw the envelope only slightly open. Messrs. Evans's representative, however, said he took the letter out of the envelope without tearing it more than it was torn when returned to the firm.

The Water Committee had held a special meeting to consider the matter; and the minutes of the Committee stated that, while they were satisfied that Mr. Deas opened the envelope inadvertently, they were of opinion that he was guilty of carelessness, and expressed strong disapproval of his action. It was then resolved that an intimation should be conveyed to Mr. Deas that, unless he carried out his work during the next three months to the entire satisfaction of the Committee, he would be called upon to retire from the position of Water Engineer, and that the Town Clerk should be instructed to obtain from Mr. Deas a written acceptance of this condition, failing which a legal notice terminating Mr. Deas's services in three months should be given to him. The adoption of these minutes having been formally proposed and seconded, Mr. Dodds moved, as an amendment, that the minutes should be referred back, and the Committee instructed to forthwith give the three months' notice necessary to terminate Mr. Deas's engagement. Mr. Tinnion asked the dates upon which the two tenders referred to in the questions were received; and Alderman Francomb stated that the one from Messrs. Evans and Co. came to hand on the Saturday morning, and that of the Slate Company on the Monday following.

Ultimately, the amendment was lost by 14 votes to 12, and the minutes of the Committee were then agreed to.

FATALITIES IN TAR-DISTILLATION WORKS.

Precautions Recommended by the Home Office.

In the "JOURNAL" last week (p. 350), reference was made to this subject; and it was mentioned that the Home Office had issued a series of precautions to be observed to prevent accident. We have procured from Dr. B. A. Whitelegge, C.B., the Chief nspector of Factories, a copy of the paper, which is of sufficient interest to our readers to be reproduced.

The attention of the Home Office has been directed, by the reports of the Inspectors of Factories and by the occurrence of fatal accidents, to the serious risks incurred by persons employed in works in which is carried on the distillation of tar for the production of naphtha, light oil, creosote oil, and pitch. In the last three years, eleven fatal accidents have occurred in tar-works. Five of these fatalities were due to suffocation, probably by sulphuretted hydrogen, in cleaning out the stills, and two to the accidental inhalation of sulphuretted hydrogen. Ten non-fatal accidents resulted from the inhalation of the same gas, in three instances during the cleaning out of stills. There have also been other cases of gassing. It is thought desirable, pending a revision of the existing special rules for chemical works, to urge upon the occupiers concerned the following recommendations, which are for the most part based upon the precautions actually in use in certain works. Those specified in paragraph 2 are specially important.

1.—All uncovered tar reservoirs, wells, and tanks, unless constructed so as to be at least 3 feet in height above the ground or platform, should be securely fenced, with either a brick wall or double rails, to the height of 3 feet.

2.—During the process of cleaning, every tar-still should be completely isolated from adjoining tar-stills, either by disconnecting the pipe leading from the swan-neck to the condenser worm, or by disconnecting the waste-gas pipe fixed to the worm end or receiver. Blank flanges should be inserted between the disconnections. In addition, the pitch-discharge pipe or cock at the bottom of the still should be disconnected.

3.—Every still should be ventilated and allowed to cool before persons are allowed to enter.

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4.—Every tar-still should be inspected by the foreman or other responsible person before any workman is allowed to enter.

5.—No person or persons should be allowed to enter a tar still or tank unless provided with a belt securely fastened round the body, with a rope attached, the free end to be left with two men outside, whose sole duty should be to watch and draw out any man in the tank should he appear to be affected by gas.

6.—A bottle of compressed oxygen, with mouthpiece, should be kept at all times ready for use; and printed instructions as to the use of this bottle, and the method to be employed for resuscitation by means of artificial respiration, should be kept constantly affixed. [A draft of these instructions is appended to the paper.]

7.—A supply of suitable chemical respirators, properly charged and in good condition, should be kept ready for use in case of emergency arising from sulphuretted hydrogen or certain poisonous gases. (Granules of carbon saturated with a solution of caustic soda readily absorb sulphuretted hydrogen, and may be used for charging respirators.)

8.—The use of naked lights should be strictly prohibited in any portion of the works where gas of an inflammable nature is liable to be given off.

9.—Each still should be provided with a proper safety-valve, which should at all times be kept in efficient working condition.

ORIENTAL GAS COMPANY, LIMITED.

In their report to be presented at the meeting of this Company to-morrow, the Directors make the opening statement that the steadiness of the Indian Exchange which has ruled during the past few years has rendered the financial year 1902-3 a fit period at which to effect the conversion of the Company's accounts from the value basis of 2s. to the rupee to that which, as nearly as may be, represents its actual value—viz., 1s. 4d. to the rupee. The accounts now submitted are therefore based upon the rupee value of 1s. 4d. The revenue account for the financial year shows a gratifying increase of £3000 in the gas-rental; and there is a small increase in the amount realized by residual products. Exchange has been favourable; the rates obtained throughout the year averaging fractionally in excess of 1s. 4d. to the rupee—the difference resulting in a total of £47 2s. 11d., which has been added to the exchange equalization account. The Directors also report, with much regret, that the state of health of Mr. David Coats Niven, the Engineer and Manager of the Company in Calcutta since the year 1882, precludes him from continuing his services to the Company. While accepting his resignation, the Directors have made to him a suitable recognition of his services in the past. They have appointed in his place Mr. James Clarke Watson, who for nearly seven years past has been the Assistant Engineer and Manager in Calcutta; and, in the place of Mr. Watson, they have appointed Mr. James Watt Mackay, recently Works Manager at Rochester. The balance of the profit and loss account (after payment of the interim dividend of 3½ per cent. and income-tax in June last, and after appropriations to reserve fund and suspense account) is £18,050, out of which the Directors recommend the payment of a dividend of 4½ per cent., free of income-tax, on Dec. 4 next, making a total dividend of 8 per cent. for the year, and leaving a balance of £4550 to be carried forward.

ELECTRIC LIGHTING NOTES.

Proposed Alteration of Electricity Supply Areas in London.

The Board of Trade have given notice of their intention to promote a Bill next session to provide for the alteration and readjustment of the areas of supply of electricity within the Administrative County of London, or any parts detached therefrom under the London Government Act, 1899, as authorized by the Acts and Orders made by Parliament and the Board, with the view of making the boundaries of these areas coterminous, so far as may be, with the areas of local government fixed by that Act and the Orders in Council authorized by, and made under, its provisions. The Board propose to alter and readjust, to such extent as may be found necessary or expedient for any of the above-named purposes, or as Parliament may prescribe, the boundaries of the existing areas of supply of the Local Authorities and Companies set forth in the schedule to the notice (comprising the various suppliers of electricity in the Metropolis), either by extension or limitation of those areas; and for any of these purposes to amend such of the provisions of the several Acts and Orders as may be deemed expedient. The Board will ask for power to make all necessary provisions in regard to the transfer and taking over of the existing mains, pipes, and apparatus, on terms to be agreed upon or settled by arbitration. Provision will be made for the confirmation by the Board of any arrangements between themselves which may be entered into by any of the Companies within the Administrative County of London for the purpose of making their areas of supply coterminous with the areas of local government fixed by the Act already named and the consequent Orders in Council, and to enable the Companies to enter into agreements for this purpose. Other incidental powers will be included in the Bill.

Electricity for Power Purposes at Newport (Mon.).

A proposal of the Electricity Committee of the Newport (Mon.) Corporation to supply power and light to a certain firm (who, it was estimated, would need 250,000 units a year) at 1d. per unit, led to a strong protest being made by Mr. Moxon when the Committee's report came up for consideration by the Town Council last week. Mr. Moxon said he did not think it made for efficiency or proficiency that the ratepayers should be taxed to provide power for any private firm. He understood that the cost of producing power was 1·76d. per unit, so that there would be a loss of ¾d. on every unit; while the loss on the undertaking, reckoning £3000 for depreciation, was £6764 a year. He

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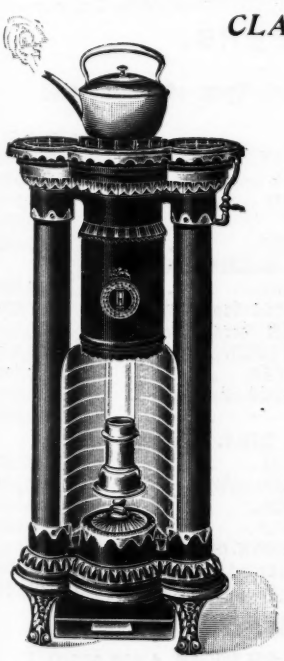

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WRITE FOR CATALOGUE OF NEW DESIGNS FOR SEASON, 1903-4.

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quoted figures to show that, after providing for repayment of interest, &c., the public would sustain a loss of 2d. per unit. This assertion was greeted with cries of "No, no" and "Nonsense;" and Alderman Mordey pointed out that the Council had promised to supply works with power, and so had prevented firms putting down their own plant for the purpose. Mr. Brown contended that, with increased consumption, the relative cost of generation was diminished; and in support of his argument, he said that with 641 consumers and 49,443 lights in 1902, the cost of generation and distribution per unit was 2·65d., while in 1903, with 756 consumers and 60,191 lights, the cost was 1·76d. per unit. The South Wales Electrical Power Supply Company were, he said, offering to furnish power at ¾d. per unit; and there was nothing whatever to prevent them coming into the borough and laying down their plant, if the Council did not themselves supply power at a cheap rate. Mr. Gower pointed out that the scale of charges agreed to some time since went down to as low as 1d. per unit, with 5 per cent. off; and Mr. Bishop said it was only by following the example of other big towns in obtaining large consumers that a profit could be made. The plant would produce the power wanted at an additional cost of 0·6d.; and there would thus be a profit of 0·4d. per unit. This, however, did not include interest and sinking fund; and if these were taken into account, the cost would be 4d. per unit. The consideration of the question at the end of the summer quarter put a very different complexion on it to what would be the case if it were considered at the end of the winter quarter. Mr. Phillips spoke in favour of obtaining long-hour customers, as distinguished from short-hour ones, and pointed out that this was the basis of the electrical undertaking. The recommendation was agreed to by a large majority.

METROPOLITAN WATER BOARD.

The Cost of the Arbitration.

A Meeting of the Board was held on Friday, at the offices of the Metropolitan Asylums Board. Mr. R. M. Beachcroft presiding.

The minutes of the previous meeting having been confirmed,

The Clerk (Mr. A. B. Pilling) reported that Mr. T. Vezey Strong had been elected to fill the vacancy created by the resignation of Sir James T. Richie as one of the representatives of the Corporation of London; also that Mr. W. R. Smith had ceased to be a member of the Deptford Borough Council, and so had retired from the Board.

The Chairman remarked that the recent municipal elections had made some difference to the constitution of the Board, and certain gentlemen, not having been re-elected, had ceased to be members of the Board. They might, however, be re-elected by the respective Councils to represent them.

The General Purposes Committee presented a report on the tenders submitted for the printing and stationery required by the Board, and recommended that the tender of Messrs. James Truscott and Sons Limited, be accepted for a period of one year.

Mr. E. H. Pickersgill moved to insert words in the contract providing that the conditions of labour should be those agreed upon by the employers and the Trade Unions.

After some discussion, the motion was carried by 25 votes to 12.

The Special Arbitration Committee reported that on the 2nd ult. the Board approved of an estimate of £14,000, submitted by the Finance Committee, in respect of expenditure to be incurred up to the end of the month in connection with the preparation and conduct of the case of the Board before the Court of Arbitration. An estimate of £30,000 had been submitted in June in respect of expenditure up to Sept. 30, thus making a total vote of £44,000 up to Oct. 31. This period having expired, the Committee asked the Board to vote an additional sum to cover the expenditure to Dec. 31. The Committee stated that the case was in active progress before the Court of Arbitration, and it would, of course, be improper for them at the present stage to make any commen, upon the proceedings. They might say, however, that the Court would apparently endeavour to sit almost continuously; and in framing their estimate for the next two months, the Solicitors had had to allow for the fact that during this period Counsel's fees and fees to witnesses would form a very large item in the bill of costs. They estimated the expenditure to be incurred from Nov. 1 to Dec. 31 at £33,000; and they recommended that this estimate, which was submitted by the Finance Committee, should be approved, and that the Special Arbitration Committee should be authorized to incur expenditure not exceeding the amount named in connection with the arbitration proceedings. They had also reported on the 2nd ult. as to the claims to be made against the Borough Councils of Croydon and Richmond, and the Councils of the urban districts of Cheshunt and Ware. They now stated that they were not yet in a position to report in the cases of Croydon and Richmond; and they were therefore arranging for an extension of time within which claims were to be deposited with the Secretary of the Court of Arbitration. With regard to Cheshunt and Ware, however, they found that the supplies by the New River Company in those districts were so insignificant (being only ten in number) that they thought no claim need be made by the Board against the District Councils in respect thereof. They accordingly recommended that the Board should not make any claim against these Councils under the provisions of section 12 of the Metropolis Water Act, 1902.

The Chairman moved the adoption of the report.

Mr. Richards drew attention to a vote of £33,000, which the Special Arbitration Committee had asked for, in respect of the arbitration proceedings, and inquired whether any explanation could be given as to items making up this large expenditure.

Mr. Elliott inquired whether it would not be possible to get the Arbitrators to give a decision in the cases of the East London and New River Companies, so that the Board and the other Companies, knowing the basis on which the Arbitrators had decided, might be able to come to terms without going to arbitration.

CARBURETTED WATER-GAS APPARATUS

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BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	ACCRINGTON	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . . 1,800,000 Cub. Ft.

The CHAIRMAN, in reply, said the questions were very inconvenient just then. The cost in the case of the East London and the New River Companies would be greater than in those of the other Companies. A large portion of the money went to the Accountants. The expenses of Counsel would probably be £20,000; and those of the Engineers called, £12,000 or £13,000. When it was borne in mind that a sum approaching £60,000,000 was involved, he did not think the expenses of an arbitration which had been forced upon them were exorbitant. The matter was still *sub judice*, and it was therefore impossible to say what the Arbitrators would do. But he thought the Board might look for an interim decision when the cases of the East London and New River Companies had been completed.

The report was adopted; and the Board adjourned.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Committee who were appointed by the Corporation of Dundee to inquire into the circumstances attending the failure of the gas supply on the evening of the autumn holiday are prosecuting their labours. On Wednesday they discussed the terms of a draft report, embodying the evidence of the Gas Manager, the Assistant-Manager, the Superintendent of the retort-house, and other employees. After full consideration, the meeting adopted a report for presentation to the Gas Committee at a meeting next week. Matters of administration, while they were discussed with force and freedom, it was considered did not come within the scope of the Committee's remit; but an indication was given that, when presenting the report of the General Committee, this phase of the matter would be fully gone into. Members held strongly to the opinion that every facility should be granted to ensure the making of such arrangements as would prevent a recurrence of the circumstances with which the Committee had had to deal. These, it was stated, besides causing great inconvenience to consumers, tended to shake public confidence in the gas-works, and involved the risk of very serious accident.

The "Dundee Advertiser" of yesterday contained the following not over-intelligent reference to the gas undertaking: "The Dundee Gas-Works, concerning the construction and management of which so much controversy has taken place within recent years, promise to afford still another sensation. In the Council Chamber and from the platforms of election meetings time and again the hope and belief have been expressed that the reconstructed works would give the very best results in the shape of cheaper gas and an absolutely stable supply. Having regard to these and utterances of similar kinds, and keeping in view the vast expenditure that has been made on buildings and plant, the general idea was that some degree of finality had been reached, and that time and the exercise of patience were all that were required to secure the promised results. In municipal circles, therefore, it has come as a great surprise that, so far from the gas-works being a complete and thoroughly up-to-date establishment adequate to meet all demands likely to be made upon them, operations of a very extensive character, involving the outlay of a very large sum, still require to be made in order to put them in that position. Such, at any rate, seems to be the conclusion of a Committee which, judged by the fact that to it was delegated the duty of investigating the recent failure of the supply, has special knowledge of gas affairs. The proceedings of that Committee were indicated in yesterday's 'Dundee Advertiser.' As stated, they have framed a report dealing with the circumstances which, in their view, led to the failure of the gas supply. But the sting of this report, which is to be submitted to a meeting of the Gas Committee on Tuesday, lies in its tail. It is recorded that the whole incident would in all probability never have occurred, had there been sufficient gasometer gas storage accommodation, whereby the necessity of throwing off retorts would not have arisen. This consideration, again, would involve either (1) increased gasometer accommodation, or (2) an auxiliary gas making plant. At the meeting at which these conclusions were submitted, the matter was fully discussed. In the course of an informal debate, it was stated that to provide a gasholder of adequate capacity, and the necessary connections and accompanying plant, would represent an expenditure of not far short of £40,000. To increase the storage accommodation of one of the present large holders by the addition of another "storey" would, it was estimated, cost about £10,000, over and above which is the outlay that would fall to be incurred by the installation of auxiliary gas-making plant. It transpired that the advantage to be derived from increased storage accommodation is that, with this available, the establishment would be in a better position to cope with the fluctuating consumption. . . . Concerning the suggested auxiliary gas-making plant, an indication was given that it might be well to consider the feasibility of introducing the carburetted water-gas system. On the other hand, it was argued that the cost would be fully as great as providing increased storage accommodation. The Committee, as indicated, refrained from recording any opinion as to whether any or either of the schemes should be entered upon. These and other matters will, as stated, be discussed at the next meeting of the Gas Committee.

Mr. R. A. Douglas, it will be remembered, at the last meeting of the Edinburgh and Leith Gas Commission, gave notice of motion to the effect that the Commissioners reconsider the subject of the salary of the Gas Manager. The Works Committee of the Commission met on Monday of this week, and Mr. Douglas asked permission to withdraw his motion. Second thoughts have turned out to be best.

At the Wishaw Town Council on Tuesday, a letter was read from the Procurator-Fiscal at Hamilton, into whose hands had been placed all the papers relating to the matters on account of which the Gas Manager was recently asked to resign. The Fiscal replied that, so far as he could see, the papers did not disclose any act of a criminal nature; and as the Council made no charge of this kind, he did not feel disposed to investigate the case. The Town Clerk stated that, along with Provost Stalker and Mr. Thomson, the Convener of the Gas Committee, he had called upon the Procurator-Fiscal, who informed them

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that a charge might be formulated, but it would be necessary to give him more details. Mr. Miller asked the Clerk if he thought there was a case in it. The Clerk replied that there certainly were suspicious circumstances. Bailie Lamont thought that ex-Bailie John Gibson should be charged with contravening section 71 of the Burgh Police Act, which relates to commissioners who directly or indirectly make profit out of any contracts or work connected with the Council; and he was of opinion that they should also take action against Mr. M'Nair, their late Manager. It was agreed to remit the matter to the Law Committee for examination and report. When the conditions of the new Gas Manager's appointment came up for consideration, Bailie Lamont proposed that he be forbidden to accept commission on any purchases or sales made in connection with the works, or to receive any presents. Provost Stalker said that if it was the custom at Christmas to give presents, he did not see any harm in the Gas Manager accepting them. It might only be a turkey. Bailie Lamont thought there might be something in the turkey. The Council eventually adopted the proposal.

A question in which the relations of Contractor and Manager appear to be looming in the shade occupied the attention of the Kilmarnock Town Council on Wednesday. It was raised by Treasurer Gemmill asking that the question of coal handling at the gas-works be gone into by the Gas Committee, and that they should have a report upon a letter which was sent by a member of the Council to the Gas Manager. Bailie Turnbull moved that the Gas Committee bring up a report upon the letter, and also as to whether it was not the case that Messrs. Grant, Ritchie, and Co., of which Mr. Ritchie, a member of the Council, was a partner, had for a long series of years been doing work for the Corporation in defiance of the law of the land and of the standing orders of the Council. Mr. Ritchie, the gentleman referred to, said it was not true. Bailie Robertson said the Gas Committee had nothing to hide, and that the proper course would be for Treasurer Gemmill to bring the matter before them. This was agreed to be done.

On Tuesday, in the Court of Session, Lord Pearson closed the record in an action by David Rintoul, of Bonnybank Cottage, Leven, Fife, and his wife against the widow and Trustees of the late William Robertson. The pursuers claim £245 as compensation for damages done to their house in consequence of defenders having, about January, 1900, erected a gas-engine on their premises. The pursuers say the vibration and noise attending its working have constituted a nuisance which has materially interfered with their possession and enjoyment of their property, and has seriously depreciated its value as a place of residence, and prevented their taking advantage of it for letting purposes. The defenders say that up to the death of William Robertson, in December, 1902, the engine was used only on rare occasions, and never continuously during the night. His sons have carried on the business since then; and the Trustees have thus never made any use whatever of the engine. Under reservation of their pleas, they offer to pay £15 for settling all claims against them or others.

The Corporation of Helensburgh have accepted an estimate for the enlargement of the upper reservoir of the town water supply (in order to give an additional storage capacity of 20 million gallons), and also for the construction of a small reservoir, of a capacity of 2 million gallons, for the supply of the upper portions of the town.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 14.

Sulphate of Ammonia.

The market has been somewhat irregular, for whereas full prices are reported to have been paid in special cases, there has been re-selling at substantially below current quotations. The bulk of the buying has been for covering contracts; direct orders being scarce. Nevertheless values have been fairly well maintained; the closing quotations being £12 per ton f.o.b. Hull, £12 1s. 3d. per ton f.o.b. Leith, and £12 1s. 3d. to £12 2s. 6d. per ton f.o.b. Liverpool. There has been good inquiry in the forward position, but the views of buyers have been too low to admit of much actual business, makers being firm, in the expectation of a recovery in values as the spring season approaches. For delivery up to the end of the year, there has been considerable buying at a shade above prompt prices.

Nitrate of Soda.

This is firm in the forward position, but with very little business passing. On spot, ordinary quality may now be had at 9s. 6d. per cwt., but refined, being scarce, is still quoted at 10s. 3d.

LONDON, *Nov.* 13.

Tar Products.

The markets continue in about the same position; but there is certainly more business doing. Several sales of pitch have recently been made to South Wales, for early delivery, on fairly good terms; but, so far as next year is concerned, buyers will not purchase. There is a general idea that the production of fuel will fall off considerably. At any rate, most of the briquette makers seem to act on this assumption. Prices are certainly easier for forward delivery. Doubtless some of the manufacturers who have renewed their tar contracts at high prices are getting anxious as to the future of this article, and are therefore desirous of placing their make. Benzol continues firm. There are buyers of 90 per cent. for prompt delivery at 10½d. per gallon; while 10¾d. is reported to have been paid for January-March next. 50-90 per cent. is also rather better. Business has been done at 8d. for November-December; and makers decline to sell further forward at present. The demand for solvent continues strong; but prices remain about the same. There are buyers of crude carbolic 60's at 1s. 6¼d. to 1s. 6½d., January-June; but makers as a rule ask 1s. 7d. In crystals, there is no business to report. As regards toluol, buyers now offer 7¼d., but there is really nothing to be secured at the moment; makers evidently not having any stocks. The price is nominally 7½d. to 8d. There have been one or two inquiries for anthracene over next

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year, but business has not resulted; makers' ideas being considerably in advance of the prices which consumers are willing to pay. Creosote continues very scarce, especially in London, where the demand for export is still strong. The prices of tar remain about the same; but there is nothing of any importance to report.

The average values during the week were: Tar, 23s. 6d. to 29s. Pitch, London, 48s. 6d. to 48s. 9d.; east coast, 47s. 6d. to 47s. 9d.; west coast, 47s. to 47s. 6d. Benzol, 90 per cent., 10½d. to 10¾d.; 50-90 per cent., 8d. Toluol, 7¼d. to 7⅜d. Crude naphtha, 3½d.; solvent naphtha, 9d. to 9½d.; heavy naphtha, 10d. to 11d. Creosote, London, 1⅞d. to 1 1/16d.; North, 1⅛d. to 1¼d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60 per cent., 1s. 6d. to 1s. 6½d. Refined naphthalene, £5 to £8. Salts, 24s. to 26s. 6d. Anthracene, "A" quality, 1¾d. to 1⅞d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market closes with a rather firmer tone than ruled earlier in the week for prompt delivery; while for forward the demand continues good. The Gaslight and Coke Company are reported to have sold a little at £12 6s. 3d. prompt, and are now asking £12 7s. 6d. for December; while the South Metropolitan Company would not accept less than £12 7s. 6d. in any position. For forward delivery, Beckton would not accept £12 10s., and, in fact, are reported to have declined this price. In Leith, business is quiet for prompt; and there does not appear to be much doing. £12 1s. 3d. is reported to have been accepted; but at present buyers offer only £12. In Hull, small sales have been made at £12 1s. 3d. for prompt; but there is nothing doing for forward delivery. In Liverpool, the market is decidedly quiet, and prices rule from £12 2s. 6d. to £12 3s. 9d. for prompt; but there is nothing offering forward at the moment.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The continued exceptional mildness of the season and the depression in the iron and engineering trades still restrict requirements for all descriptions of fuel, and keep collieries on short time. For house-fire consumption, the demand shows little or no expansion. The best qualities of round coal are hanging at many of the collieries, notwithstanding pits do not average more than four days per week. Medium sorts move off fairly well, but are plentiful. There is still a good deal of surplus output coming in from outside districts, which is offered for clearance at special low-cut figures. The quotations of Lancashire collieries remain unchanged, but not more than maintained at late rates. Best Wigan Arley still averages 13s. 6d. to 14s. 6d. per ton at the pits, seconds Arley and Pemberton four-feet 11s. and 11s. 6d. to 12s. 6d., with common house-fire coals about 9s. 6d. to 10s. 6d. Good ordinary qualities of steam and forge coal are quoted about 8s. 6d. to 8s. 9d. per ton. But these are outside figures; ordinary descriptions being readily obtainable at from 7s. 9d. to 8s. 3d., and for shipment at 8s. 9d. to 9s. 3d. delivered at the ports on the Mersey. The better qualities of slack are moving off fairly well owing to restricted output and increased inquiry for mill purposes. As a rule, Lancashire collieries have no difficulty in disposing of what they are raising, and are able to hold firmly to recent quotations averaging 6s. 3d. up to 6s. 6d. and 6s. 9d. per ton at the pit for the very best descriptions, with medium slacks about 5s. to 5s. 6d. Common slacks continue plentiful, as there are large supplies in outside districts which are offering here, and do not average more than about 4s. and 4s. 3d. to 4s. 6d.

Northern Coal Trade.

The demand for steam coals is now decidedly less; the Baltic demand for fuel having practically ceased for this season, so that some of the collieries are barely able to keep the pits fully at work. The effect of this is seen on the price of steam coals. Best Northumbrian steams are about 9s. 9d. per ton f.o.b., with a fair demand; second-class steams are 8s. 6d. to 8s. 9d.; and steam smalls are about 4s. 9d. In gas coals, the supply is now heavily drawn upon; and the deliveries on the large contracts are about at their fullest. For occasional cargoes, the price quoted is from 8s. 3d. to 8s. 9d. per ton f.o.b.; but there is not much of the best class of gas coals available for the purpose for the rest of this month. No additional contracts of any moment are reported for gas coals for the past few days; but a few sales for next year's delivery are in treaty. For gas coke there seems to be a relatively good demand, though the enlarged production makes the general supply ample. Prices are unaltered.

Scotch Coal Trade.

There is no change to record in the quality of the trade which is being done; and any variation in prices is trifling. At present there is no apparent prospect of improvement in business. The prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 6d. to 9s. 9d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 214,415 tons—a decrease of 33,654 tons upon the preceding week, and of 42,779 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,602,124 tons—an increase of 175,575 tons upon the same period of last year.

Recognizing the Water Engineer's Services at Ipswich.—Under the direction and supervision of the Corporation Water Engineer (Mr. Hamlet Roberts, Assoc.M.Inst.C.E.), a new reservoir of 4½ million gallons capacity has been constructed for Ipswich. The sum expended on the work amounted to £19,549, or £4350 per million gallons, as against the estimate of £5000. The reservoir was designed, and all the plans, sections, and working drawings prepared, by Mr. Roberts. The Town Council are well pleased with his work in connection with the matter; and, at their annual meeting yesterday week, they voted him, upon the unanimous recommendation of the Water Committee, 400 guineas for his special services.

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Birkdale Gas Supply.—The Urban District Council of Birkdale intend applying to Parliament next session for an Act to authorize them to enter into agreement with the Corporation of Southport for the purchase of the Birkdale portion of their gas undertaking; to borrow the money necessary for such purpose; and to take a supply of gas in bulk from the Corporation.

Strabane New Gas-Works.—The Local Government Board have intimated their consent to the application of the Strabane Urban Council for permission to borrow £15,000 for the erection of new gas-works. The loan is repayable in forty years. In view of this, the Council—as will be seen by the announcement in our advertisement columns—are asking for tenders for the erection of works in accordance with the scheme prepared by Mr. Charles Hunt, M.Inst.C.E.

Skipton Water Scheme.—The Skipton Urban Council have agreed to apply in the next session of Parliament for an Act to autho-rize the carrying out of the Embsay water scheme, at an estimated cost of £72,000. They also decided to obtain powers to purchase the undertaking of the Embsay Water-Works Company, Limited. Messrs. Hill and Sons, of Manchester, have been appointed Engineers of the scheme, with the assistance of Mr. J. Mallinson, the Town Surveyor, who will prepare the necessary plans, &c.

Southport Public Lighting.—The annual report of the Highways Committee of the Southport Corporation contains some statistics as to the public lighting. There are 57½ miles of streets within the borough, and the lighting of the lamps is under the control of the Lighting Committee. There are 12 Bray's lamps, 1638 incandescent lamps, and 114 ordinary lamps. The consumption of gas as registered for incandescent lamps at one meter is 14,500 cubic feet for the year, or at the rate of 4·64 cubic feet per hour. Another meter registered 14,200 cubic feet, or at the rate of 4·51 cubic feet per hour.

Water Supply for Lydney.—The town and parish of Lydney, with a population of about 3500, has just been provided with a water supply, in accordance with plans prepared by Mr. J. Fletcher Trew, of Gloucester. The works comprise a pumping-station situated about three miles from the town, twin reservoirs near Rockwood, and about 12 miles of mains. The well and adits yield per 24 hours about 260,000 gallons of excellent water. The reservoirs, which will hold 190,000 gallons, are constructed of cement concrete, and are covered. A special feature of the scheme is a high-pressure main from the reservoirs to the elevated district at Allaston. The pumping power employed consists of a gas and an oil engine. The cost of the scheme, including legal and engineering expenses, has been about £10,000.

More Trade Union Tyranny.—The latest example of the lengths to which Trade Unions are prepared to go in their interference with the right of a workman to do as he pleases, is to be found in the "Boot and Shoe Trades Journal." Our contemporary cites the case of a "clicker," working at the largest boot factory in Leicester, who had been earning and receiving 2s. a week more than the usual wage. This was considered and debated upon by the Union officials, who promptly fined the member 7s. 6d. for being clever enough at his trade to earn 2s. a week more than the Union permitted him to. The relater of the story remarks that "to be in bad credit is now a small item compared with being under the attention of the Union officials." Surely there must be a remedy for such a harmful state of affairs as is here portrayed.

A Small Water Company Meeting.—The Newhaven and Seaford Water Company had a very quiet meeting last week; not a single shareholder (with the exception, of course, of the members of the Board) putting in an appearance. However, the business was got through without any hitch. The Directors' remuneration was proposed by the Secretary and seconded by a member of the Board; while the Chairman also received the usual vote of thanks for presiding and for his services during the year. The report stated that the revenue account showed a profit for the twelve months ending September 29 of £2167; the balance available for dividend amounting to £2078. Out of this, dividends were recommended at the rates of 4½ per cent. per annum on the original "A" capital and £3 3s. per cent. on the additional "B" capital (both free of income-tax), leaving a balance of £515 to be carried forward.

Serious Gas Explosions.—A private residence in South Shields was last Thursday evening the scene of a somewhat serious accident. Two servants were engaged cleaning the house; and on one of them going into the front drawing-room and turning on the gas (an incandescent burner, fitted with a bye-pass), there was an immediate explosion, which almost wrecked the room. The bay windows, together with a large portion of the stone-work, were blown into the street; and one of the inner walls of the room collapsed. The whole house was severely shaken; and a second wall was so badly damaged that it was deemed advisable to pull it down altogether. One of the girls was burnt about the neck and hands; and both suffered from shock. A violent explosion has also occurred in the Mayall Road, Brixton, caused by searching for a leakage of gas with a lighted taper. In this instance, no personal injury was sustained, though no less than eleven houses are reported to have suffered damage.

Gas Supply in Birkdale Out-Districts.—At Birkdale, last Thursday, an inquiry was held by a Committee of the Lancashire County Council (Mr. V. K. Armitage presiding) into an application on the part of the Birkdale Urban District Council to incorporate the township of Ainsdale. By an agreement made between the Ainsdale Parish Council and the Birkdale District Council Birkdale undertakes, so soon as practicable after the date of incorporation, to connect their gas-mains with those in the added township, and at all times to use their best endeavours to arrange for the supply of gas for all public and private purposes on at least as favourable terms to the consumers as shall at the time being exist in Birkdale. For fifteen years Ainsdale is to have its general district rate limited to 1s. 6d. in the pound. Mr. G. M'Naught opposed the application on behalf of Mr. Chas. J. Weld-Blundell, the Lord of the Manor. At the close of the inquiry, the Chairman of the Committee said they were of opinion that the application of the District Council should be granted; and they would so report to the Local Government Board.

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Sales of Shares.—At recent sales by auction, 37 "A" shares in the Bilston Gas Company realized £13 7s. 6d. each, and 45 full-paid £10 shares in the Torrington Gas Company from £14 10s. to £15 each.

Reduction in Price.—The Wrexham Gas Company announce that, as from the commencement of the present quarter, an extra 3d. per 1000 cubic feet will be allowed off the price of gas used for lighting purposes through ordinary meters—making the net price within a radius of a mile 2s. 9d. per 1000 cubic feet.

Quality of Gosport Water.—The saline quality of the water supplied to the inhabitants of Gosport continues to attract public attention in the neighbourhood; and the District Council last Thursday resolved to approach the Water Company, with a view to the purchase of their works. It is generally thought that the Foxbury works can scarcely be depended upon to yield the required pure supply, and that, whoever has to furnish the water, another source than that hitherto used will have to be obtained.

Sulphur in Gas Said to Cause Fainting.—At a recent meeting of the Saddleworth Highways Committee, Dr. Ramsden, the Medical Officer of Health, drew attention to the amount of sulphur contained in the gas supplied by the Mossley Corporation. Several people in a Delph place of worship had, he said, fainted on account of the quantity of sulphur in the gas. Mr. Bottomley remarked that a similar case occurred at Greenfield the previous week. The Chairman pointed out that the matter was in the hands of the Lighting Committee. He hoped all who felt aggrieved would write to the Mossley Corporation, as well as the Council.

The Borrowing Powers of the Manchester Gas Committee.—The Manchester City Council have agreed to the proposal of the Gas Committee that application should be made to the Local Government Board for a Provisional Order conferring upon the Corporation power to borrow £1,000,000 for purposes connected with the gas-works. Alderman Gibson, the Chairman of the Committee, said that since 1893, about £100,000 a year had been spent on the development of the Gas Department. The existing borrowing powers were, however, now practically exhausted; and it would be necessary in the near future to proceed with additional works at the Bradford Road station.

Portsmouth Water Company.—The report which the Directors of the Portsmouth Water Company will present at the half-yearly meeting on the 26th inst., states that the available balance on the profit and loss account is £24,503, out of which the payment of the full statutory dividends is recommended. This, after deductions for void houses, &c., will leave a balance of about £6987 to be carried forward. During the half year, 3205 yards of additional street service-mains and 9678 yards of trunk mains were laid, making a total of about 60 miles of trunk mains and 139 miles of street service-mains. The number of additional services connected with the mains during the six months was 662, making the total number of premises now under constant supply by the Company in all the districts 43,459. The quantity of water pumped from Havant, Bedhampton, and Farlington during the half year was 1,328,897,000 gallons, or an average daily supply for all purposes of 7,261,000 gallons—being a decrease of 877,000 gallons daily as compared with the corresponding period of last year. The quantity supplied for domestic use was equal to an average of about 24·5 gallons per day per head of the population, exclusive of all supplies by meter. The new 20-inch main, with temporary connections, for the exclusive supply to H.M. Dockyard and Admiralty establishments at Portsmouth, referred to in the last report, was brought into use on Aug. 1.

Deputation of Messrs. Willey's Employees to Visit America.—Many of our readers are doubtless aware that Mr. H. A. Willey has been travelling in the United States; and he is now recording his impressions of America in the weekly publication emanating from his firm, to which attention has already been called. In the course of his travels, he found much, in connection with industry and municipal government, which would be worthy of attention by the artizans of this country. He has therefore arranged to send to the States a deputation, consisting of seven managers and workmen representative of the various departments of his business, to study the conditions affecting labour, the fiscal policy, education, and other matters. In order to make their investigations as useful and as complete as possible, they will be accompanied by two representatives of labour organizations and friendly societies. The party will leave Exeter this afternoon, and will start from Southampton in the *Kronprinz Wilhelm* to-morrow morning. As at present arranged, the following places will be visited, though not necessarily by the whole of the delegates: New York, Bridgeport, Hartford, Providence, Boston, Worcester, Springfield, Schenectady, Buffalo (and Niagara), Cleveland, Chicago, Dubuque, Pittsburgh, Dayton, Cincinnati, and Philadelphia. These sixteen towns are situated in eight of the 38 States, and have a total population of about 4½ millions. The party will, we understand, have free access to any works or institutions they may consider it desirable to inspect. We believe, with Mr. Willey, that this is the first commission of artizans sent from England on a similar errand; and we heartily wish that their labours may be beneficial, not only to himself and to his employees, but to the great mass of workers in this country.

Mr. Edwin Thornton, the Secretary of the Airedale Gas Company, one of the undertakings acquired by the Bradford Corporation, under their Act of last year, has been awarded £1036 compensation for the loss of his office.

We have received from Messrs. Moffat's Limited, an attractively prepared catalogue of their Lucas lights. The pamphlet—which is dedicated "to the progressive gas engineer, the wideawake municipal official, the enterprising tradesman, and all others whose sympathy and interests are with the progress of efficient and economical lighting"—contains a large number of illustrations of different forms of the lamp, both for inside aud outside use, ranging in illuminating power from 200 to 1000 candles for single burners. Some of the patterns specially suitable for lighting churches, chapels, and public buildings are extremely effective in design.

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(PARKINSON BRANCH),

LONDON AND BIRMINGHAM.

A compulsory winding-up order was made by Mr. Justice Buckley last week in the case of the Household Gas Heater and Cooker (Parent) Company, Limited.

The Biggleswade Gas Company have decided to convert their direct-fired settings to regenerators, and have placed the contract with Messrs. R. Dempster and Sons, Limited, of Elland. The system to be employed is Waddell's patent.

According to a telegram through Reuter's Agency, the Lozar Hotel at Ridgetown, Ontario, a three-storey building, has been wrecked by the explosion of an acetylene gas plant in the basement. Three men were killed on the spot; while six were seriously injured, and many others slightly hurt.

Consequent on the expiration, on the 19th ult., of the Bridgewater Trust, the business of colliery proprietors, hitherto conducted in that name, will be carried on by the Earl of Ellesmere. It will be under the superintendence of Mr. Thomas M. Brown, at the Bridgewater Coal Office, No. 4, Chapel Walks, Manchester.

The Directors of the Continental Union Gas Company, Limited, have decided to recommend, at the forthcoming general meeting, dividends for the past half year of 4 per cent. on the ordinary stock, free of income-tax, and of 3½ per cent. on the preference stock, less income-tax; making 7 per cent. in each case for the year.

An extraordinary spectacle was witnessed at Clapham Junction early last Thursday morning, when the railway line and station were flooded with several inches of water from a burst main belonging to the Southwark and Vauxhall Water Company, which runs under the roadway in the high ground above the station. Fortunately no serious damage is recorded as the result of the accident.

A serious burst occurred on Saturday evening in the Stourbridge Canal, about 50 yards from the Great Western Railway at Brettel Lane. Very great damage was done to the fire-clay works of Mr. George King Harrison, part of the water cutting a deep channel for itself through the place. Had the accident occurred during working hours, there must have been loss of life, in addition to the extensive damage to property.

The Industrial Freedom League do not lose any opportunity of bringing under notice the objectionable features of municipal trading. In a leaflet lately issued, they direct special attention to the increase in the number of employees now required by local authorities to carry on their various undertakings; and they regard this as a menace to the common weal. The position taken up by the League is supported by extracts from the report of the Joint Committee on Municipal Trading, which has recently been abstracted in our columns. The disadvantages of direct labour are also emphasized by some remarks of Mr. Weaver, the Borough Engineer of Kensington.

By an announcement which appears elsewhere, it will be seen that the West Ham Gas Company are inviting tenders for £85,000 of 5 per cent. preference stock—being part of the £250,000 authorized to be issued by their Act of 1902. The steady growth of the Company's business is shown by the fact that the net profits for the year 1880, after payment of the debenture interest, amounted to £18,552; whereas those for the six months ending at Midsummer last were £20,091, or £1539 more. The dividend on the issue of stock now offered is equal to only one-eighth of last year's net profit. The minimum price is £110 per cent. Tenders for the stock are to be delivered by noon on Thursday next.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMAN AND CLERK. Maidstone Gas Company.
WORKING FOREMAN (East Coast). No. 4123.
FOREMAN PLUMBER, &c. Morpeth Gaslight Company.

Situations Wanted.

MANAGER (Medium Sized Works). No. 4124.
GAS-FITTER. No. 4125.
AGENCY WANTED. Fire-Clay Goods, &c. No. 4126.

Agents Wanted.

"GAS-WORKS," c/o Street's, London.

Plant for Sale.

STATION METER. Shepshed Gas-Works.

Plant Wanted.

PUMP FOR DEEP WELL. Broadstairs Gas-Works.

Sales of Stocks and Shares.

BRISTOL GAS COMPANY. Dec. 10.
CROYDON GAS COMPANY. Dec. 2.
HARROW AND STANMORE GAS COMPANY. Dec. 8.
LEATHERHEAD AND DISTRICT WATER COMPANY. Nov. 27.
RUSHDEN AND HIGHAM FERRERS GAS COMPANY. Nov. 27.
SOUTHEND GAS COMPANY. Dec. 8.
WEST HAM GAS COMPANY. Nov. 19.

TENDERS FOR

Carbon.

LLANDUDNO GAS DEPARTMENT. Tenders by Dec. 3.

Gas-Works (Complete).

STRABANE URBAN DISTRICT COUNCIL. Tenders by Dec. 15.

Pipes and Connections, &c.

ALDERSHOT GAS AND WATER COMPANY. Tenders by Dec. 4.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Nov. 30.

Roof (Steel), Doors, and Chimney.

CLACTON URBAN DISTRICT COUNCIL. Tenders by Nov. 30.

Sulphuric Acid.

ALDERSHOT GAS AND WATER COMPANY. Tenders by Dec. 4.
SALFORD GAS DEPARTMENT. Tenders by Nov. 26.

Tar.

ALDERSHOT GAS AND WATER COMPANY. Tenders by Dec. 4.
BRIDGEWATER COLLIERIES. Tenders by Dec. 7.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 407.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18½–19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	12½–13½	..	5 11 1
200,000	5	Nov. 12	6½	Bombay, Ltd.	5⅝–6⅝	+⅛	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4–4½*	+⅛	5 15 7
380,000	Stk.	Aug. 13	12	Brentford Consolidated	230–235	..	5 2 2
300,000	,,	,,	9	Do. New	173–178	..	5 1 1
50,000	,,	,,	5	Do. 5 p.c. Pref.	150–135	..	3 14 1
206,250	,,	June 11	4	Do. 4 p.c. Deb.	105–110	..	3 12 9
220,000	Stk.	Sept. 11	10½	Brighton & Hove Orig.	207–212	..	5 1 5
246,320	,,	,,	7½	Do. A. Ord. Stk.	145–150	..	5 3 4
460,000	20	Oct. 15	10	British.	38½–39½	..	5 1 3
100,000	Stk.	Aug. 13	6	Bromley, Ord. 5 p.c.	115–120	..	5 0 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	88–93	..	4 16 9
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	10⅛–10⅝	..	6 10 3
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93–95	..	4 4 3
150,000	20	July 10	8½	Cagliari, Ltd.	22–24	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14½–15½	..	6 9 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	52–54	..	5 11 1
1,375,000	Stk.	Aug. 27	5 5/10	Commercial 4 p.c. Stk.	105–108	..	4 16 3
503,750	,,	,,	5	Do. 3½ p.c. do.	99–102	..	4 18 0
442,947	,,	June 11	3	Do. 3 p.c. Deb. do.	87–90	..	3 6 8
800,000	Stk.	June 11	7	Continental Union, Ltd.	118–123	..	5 13 10
200,000	,,	,,	7	Do. 7 p.c. Pref.	130–135	−5	5 3 8
575,000	Stk.	Aug. 27	5½	Crystal Palace Ord. 5 p.c.	112–117	..	4 11 1
60,000	,,	,,	5	Do. 5 p.c. Pref.	118–123	..	4 1 4
112,533	,,	July 10	5	Do. 5 p.c. Deb. Stk.	135–138	..	3 12 6
486,090	10	July 29	10½	European, Ltd.	18–19	+½	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13–14	+½	5 12 6
15,243,200	Stk.	Aug. 13	4 5/10	Gaslight and Coke	4 p.c. Ord.	85–87	..	5 1 2
2,600,000	,,	,,	3½		3½ p.c. max.	86–88	..	3 19 7
3,799,735	,,	,,	4		4 p.c. Con. Pref.	106–109	+2	3 13 5
4,193,975	,,	June 11	3		3 p.c. Con. Deb.	87–89	..	3 7 5
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90–95	..	5 5 3
70,000	10	Oct. 15	8	Hongkong & China, Ltd.	15–16	..	5 0 0
3,800,000	Stk.	Nov. 12	10	Imperial Continental	198–203*	+1	4 18 6
473,600	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.	99–102	..	3 8 7
165,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	113–118	..	5 1 8
561,000	Stk.	,,	10	Liverpool United A	214–216	..	4 12 7
718,100	,,	,,	7	Do. do. B	163–165	..	4 4 10
306,083	,,	June 26	4	Do. do. Deb. Stk.	110–112	..	3 11 5
75,000	5	June 11	5	Malta & Medn., Ltd.	4¼–4⅝	..	5 5 3
560,000	100	Oct. 1	5	Met. of	5 p.c. Deb.	101–105	..	4 15 3
250,000	100	,,	4½	Melbourne	4½ p.c. Deb.	100–102	..	4 8 3
541,920	20	Nov. 12	3½	Monte Video, Ltd.	9–10*	+¼	7 0 0
1,515,892	Stk.	Aug. 13	4½	Newc'tle & G'tesh'd Con.	104½–105½	+½	4 5 4
376,855	Stk.	July 3	3½	Do. 3½ p.c. Deb.	96½–97½	..	3 11 10
300,000	Stk.	May 14	8	Oriental, Ltd.	140–145	..	5 10 4
600,000	5	Sept. 30	7	Ottoman, Ltd.	5⅞–6⅛	..	5 7 8
				* Ex div.			

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
205,005	Stk.	June 26	6½	Ply'mth & St'house 5 p.c	123–128	..	4 15 8
851,070	10	Oct. 15	7	River Plate Ord.	10¾–11¼	..	6 4 5
300,000	Stk.	June 26	4	Do. 4 p.c. Deb.	94–96	..	4 3 4
250,000	10	Sept. 30	8	San Paulo, Ltd.	10½–11½	..	6 19 2
135,000	Stk.	Sept. 11	10	Sheffield A	239–241	..	4 3 0
209,984	,,	,,	10	Do. B	239–241	..	4 3 0
523,498	,,	,,	10	Do. C	239–241	..	4 3 0
116,106	Stk.	Sept. 30	5	Shrewsbury Ord. 5 p.c.	103–112	..	4 9 3
6,150,000	Stk.	Aug. 13	5½	South Met., 4 p.c. Ord.	117–120	..	4 8 10
1,780,000	,,	July 10	3	Do. 3 p.c. Deb.	87–90	..	3 6 8
380,940	Stk.	Nov. 12	5	Southampton Ord.	104–108*	+1	4 12 7
87,950	,,	July 10	4	Do. 4 p.c. Deb.	102–105	..	3 16 2
120,000	Stk.	Aug. 27	6	Tottenham and Edmonton	A. 5 p.c.	115–120	..	5 0 0
313,020	,,	,,	4½		B. 3½ p.c.	95–100	..	4 10 0
182,380	10	June 11	8	Tuscan, Ltd.	8–9	..	8 17 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	58–100	..	5 0 0
737,142	Stk.	Aug. 13	5	West Ham, 5 p.c. Ord.	93–58	..	5 2 0
				WATER COMPANIES.			
780,776	Stk.	June 26	11½	Chelsea, Ord.	300–310	..	3 14 2
150,000	,,	,,	5	Do. 5 p.c. Pref.	145–148	..	3 7 7
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	132–137	..	3 5 8
175,785	,,	Sept. 30	4½	Do. 4½ p.c. Deb.	135–140	..	3 4 4
1,720,560	Stk.	Oct. 15	8	East London, Ord.	198–203	−5	3 18 10
654,740	,,	June 11	4½	Do. 4½ p.c. Deb.	138–143	..	3 2 11
1,282,943	,,	,,	3	Do. 3 p.c. Deb.	92–95	..	3 3 2
700,000	50	June 11	10	Grand Junction	10 p.c. max.	120–125	..	4 0 0
310,000	Stk.	Sept. 30	4		4 p.c. Deb.	120–125	..	3 4 0
708,000	Stk.	Aug. 13	10	Kent	275–285	..	3 10 2
160,000	,,	,,	7	Do. New, 7 p.c. max.	185–195	..	3 11 10
1,043,800	100	June 26	11	Lambeth, 10 p.c. max.	285–295	..	3 14 7
406,200	100	,,	8½	Do. 7½ p.c. max.	205–215	−5	3 19 1
350,000	Stk.	Sept. 30	4	Do. 4 p.c. Deb.	120–125	..	3 4 0
500,000	100	Aug. 13	12 5/10	New River, New Shares	370–390	−5	3 5 7
1,000,000	Stk.	July 29	4	Do. 4 p.c. Deb.	121–124	..	3 4 6
902,300	Stk.	June 11	7½	South-wark and Vauxhall	Ord.	225–230	−3	3 5 3
126,500	100	,,	7½		7½ p.c. max.	200–210	..	3 11 5
489,200	Stk.	,,	5		5 p.c. Pref.	145–150	..	3 6 8
1,019,585	,,	Oct. 15	4		4 p.c. A Deb.	120–125	..	3 4 0
1,155,066	Stk.	June 11	10	West Middlesex	265–275	..	3 12 9
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	133–138	..	3 5 3
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb.	92–95	..	3 3 2
				* Ex div.			

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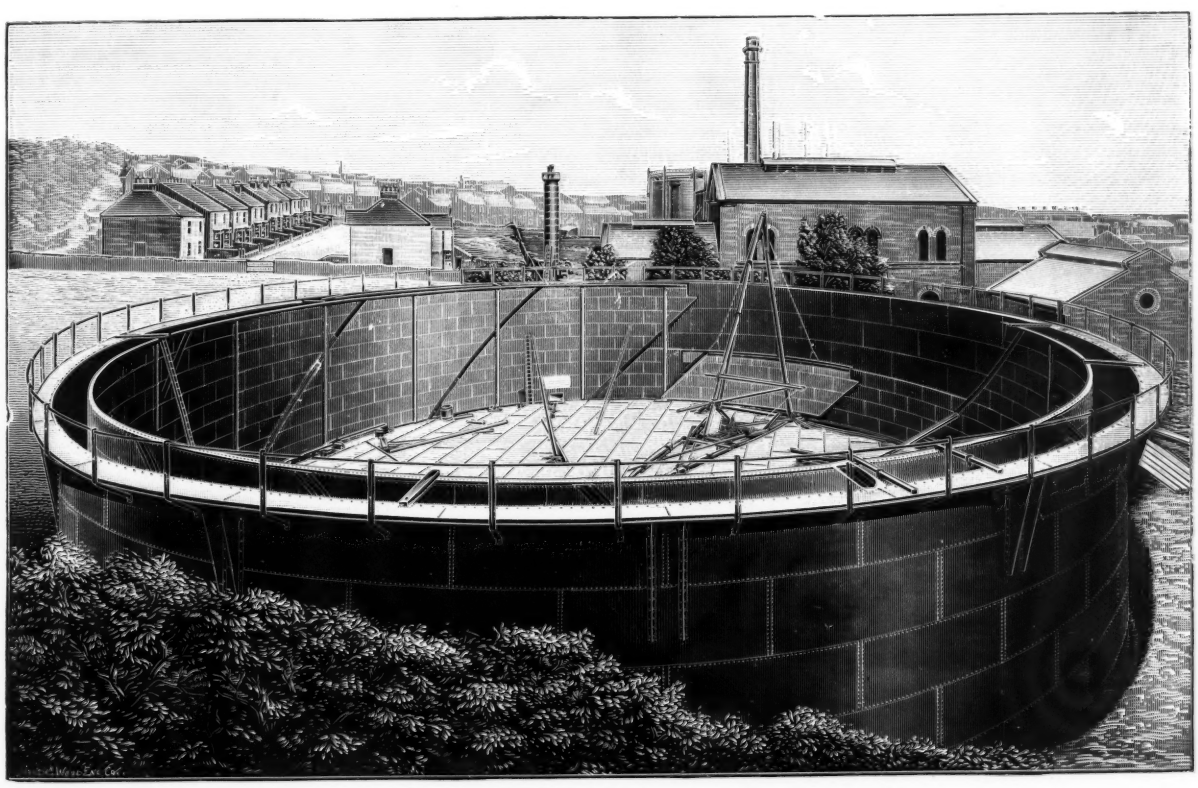

Photo. showing state of Work **3 MONTHS** after receiving Order.

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Applications to be addressed, in first instance, to "GAS-WORKS," care of Street's, 30, Cornhill, LONDON.

WANTED, a Foreman Plumber. Must be competent to Take Charge of Workmen, read Indices of Meters, and assist the Manager generally. State Age and Wages required.
Apply, with Name of last Employer and References as to character and ability, to the SECRETARY, Morpeth Gaslight Company, Ltd., MORPETH.

WANTED, by the Maidstone Gas Company, a good DRAUGHTSMAN and CLERK, accustomed to the work in a Gas Manager's Office. Wages 30s. per week.
Apply, stating Age and Experience, and with Testimonials, to the undersigned, on or before Wednesday, Nov. 25 next.
H. J. SMYTHE,
Engineer and General Manager.
Gas-Works, Maidstone,
Nov. 3, 1903.

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State Quantity to offer for Prompt and Forward Delivery.
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WANTED, a Gas-Fitter used to Iron and Compo. Fitting, Cookers, Fires, Prepayment and Ordinary Meters, Main and Service Laying, and General Repairs in Gas-Works.
None but young steady Men need apply, stating References, Wages, Age, and if Married, to H. WIMHURST, Manager, Gas-Works, SLEAFORD.

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Two (18 inch) SQUARE STATION METERS, new drums.
TOWER SCRUBBERS from 3 ft. 6 in. up to 12 feet diameter, in pairs or singly.
Patent WASHERS, 8-inch, 10-inch, and 12-inch, by "Holmes," "Kirkham," "Walker," and "Livesey."
EXHAUSTERS, patent type, from 2000 to 100,000 cubic feet per hour.
CONDENSERS, RETORT IRONWORK, GASHOLDERS, STEEL TANKS.
Every description of New and Second-Hand Gas Plant made and supplied.
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THE Llandudno Urban District Council invite TENDERS for 6 Tons (or thereabouts) of RETORT CARBON.
Tenders, endorsed "Tender for Carbon," should be sent in to the undersigned on or before Thursday, the 3rd day of December, 1903.
The Council do not bind themselves to accept the highest or any Tender.
ALFRED CONOLLY,
Clerk to the Council.
Town Hall, Llandudno.
Nov. 12, 1903.

TO BE SOLD—Gas Valves (Six Screw) by Walker, 16 in. diameter; also Six RACK and PINION, by Donkin, same size. Equal to new.

GASHOLDER, 22 feet by 10 feet, with Steel Tank. Self contained.

Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of about 1800 Tons of SULPHURIC ACID, to be delivered during the year 1904.

Full particulars may be obtained on application to Mr. Wm. W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Acid," to be delivered to me not later than Three p.m. on Thursday, the 26th of November, 1903.

L. C. EVANS,
Town Clerk.

Town Hall, Salford,
Nov. 11, 1903.

CLACTON URBAN DISTRICT COUNCIL.

GREAT BENTLEY WATER-WORKS.

THE above Council are prepared to receive TENDERS for the Manufacture and Erection of STEEL ROOF, DOORS, and CHIMNEY at their Water-Works, Moor Lane, Great Bentley, Essex.

Copies of Drawings, Specification, and Form of Tender may be obtained from the Council's Engineer, Mr. Sydney Francis, A.M.I.Mec.E., Town Hall, Clacton-on-Sea, on payment of One Guinea (which will be returned on receipt of *bona-fide* Tender).

Sealed Tenders, endorsed "Tender for Steelwork," to be delivered to the undersigned not later than noon on Monday, Nov. 30, 1903.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall Buildings,
Clacton-on-Sea, Nov. 11, 1903.

THE EDINBURGH AND LEITH CORPORATIONS GAS COMMISSIONERS.

TO PIPE FOUNDERS.

THE Gas Commissioners are prepared to receive TENDERS for the supply and delivery of about 650 Tons of 24-inch, 170 Tons 15-inch, and 355 Tons 12-inch Diameter Cast-Iron Spigot and Faucet MAIN PIPES, in 12 feet lengths, along with CONNECTIONS and SPECIALS.

Contractors may also quote for Pipes to their own pattern, but not exceeding the specified weight.

Deliveries to be in regular weekly quantities or as required, commencing at the end of April and continuing up to the end of September, 1904.

The Pipes and Connections are to be delivered free in waggons on the North British or Caledonian Railway Systems, or free on rail at Leith or Granton Harbours.

Specifications, Schedules, and Forms of Tender can be obtained upon application to Mr. W. R. Herring, M.Inst.C.E., Chief Engineer and Manager, New Street Works, Edinburgh.

Tenders to be lodged with the undersigned on or before Monday, the 30th day of November, 1903, not later than Ten a.m., endorsed "Tender for Main Pipes."

The Commissioners do not bind themselves to accept the lowest or any offer, and reserve to themselves the right of accepting the whole or any portion of the material tendered for.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh.
Nov. 11, 1903.

ALDERSHOT GAS AND WATER COMPANY.

THE Directors are prepared to receive and consider TENDERS for the following:—

The purchase of surplus TAR (approximately 1000 Tons) produced at their Gas-Works, Ash Road, Aldershot (private siding into Works, Tongham Station, L. & S.W. Ry.), and North Camp and Farnborough Gas-Works (private Siding into Works, North Camp Station, S.E. & C. Ry.), for a Year, from Jan. 1 to Dec. 31, 1904.

Specifications and Conditions can be obtained on application.

Tenders to be sent in to the undersigned, endorsed "Surplus Tar," to arrive not later than Nine a.m. on Friday, Dec. 4, 1903.

The highest or any Tender not necessarily accepted.

The Supply and Delivery of best SULPHURIC ACID, free from Arsenic and Nitrous Compounds, delivered in Tank-Waggons (or Carboys, if necessary), to Tongham Station (Company's private siding, L. & S.W. Ry.), for a Year from Jan. 1 to Dec. 31, 1904.

Specification and Conditions can be obtained on application.

Tenders to be sent in to the undersigned, endorsed "Sulphuric Acid," to arrive not later than Nine a.m. on Friday, Dec. 4, 1903.

The lowest or any Tender not necessarily accepted.

The Supply and Delivery of best quality, tested, GAS TUBES and FITTINGS, GALVANIZED WATER TUBES and FITTINGS, and STEAM TUBES and FITTINGS, as required, for a Year from Jan. 1 to Dec. 31, 1904, at the following Works and Depots:—

Aldershot, S.E. & C. Rly. or L. & S.W. Rly.
Tongham, L. & S.W. Rly.
North Camp, S.E. & C. Rly.
Fleet, L. & S.W. Rly.
Camberley and Frimley, L. & S.W. Rly.
Particulars on Application.

Tenders to be sent in to the undersigned, endorsed "Tubes and Fittings," to arrive not later than Nine a.m. on Friday, Dec. 4, 1903.

The lowest or any Tender not necessarily accepted.

By order,
R. W. EDWARDS,
Secretary.

RUSHDEN & HIGHAM FERRERS DISTRICT GAS COMPANY.

(Incorporated by the Rushden and Higham Ferrers District Gas Act, 1899.)

CAPITAL - £40,000

DIVIDED INTO

£20,000 - - Original Stock.

£20,000 - - Additional Stock.

DIRECTORS:

Mr. E. CLARIDGE, *Chairman.*
Mr. E. B. RANDALL, *Vice-Chairman.*
Mr. P. CAVE. Mr. J. S. MASON.
Mr. J. CLARIDE. Mr. O. PARKER.
Mr. G. H. GROOME. Mr. W. RADBURNE.
Mr. C. JOLLEY. Mr. W. B. SANDERS.
Mr. F. KNIGHT. Mr. W. SPONG.

Bankers—THE NORTHAMPTONSHIRE UNION BANK, LTD., RUSHDEN.

Engineer and Manager—Mr. THOS. WATSON.

Auditors—Mr. W. H. WILKINS AND Mr. J. T. COLSON.

Solicitors—Messrs. SIMPSON AND MASON.

Secretary—Mr. G. S. MASON.

SALE BY TENDER OF £4000 ADDITIONAL ORDINARY STOCK

IN THE ABOVE COMPANY.

This Stock has an Authorized Standard Rate of Dividend of

SEVEN PER CENT.

but in all other respects is on an absolute equality with the Original Ordinary Stock.

THE FOLLOWING TABLE SHOWS

THE PROGRESS OF THE COMPANY

Since its formation in the Year 1894.

Year.	Feet of Gas sold.	Price per 1000 Feet. (Subject to a discount of 2d. per 1000 ft. for prompt payment.)		Paid up Capital & Dividends.			
				Original Ordinary Stock.	Rate of Dividend Paid.	Additional Ordinary Stock.	Rate of Dividend Paid.
				£	£ p'r c'nt.		£ p'r c't.
		a.	*b.*				
1894	17,104,000	3/6	4 0	10,000	*5		
1895	20,043,000	3/6	4 0	10,000	*6		
1896	28,292,000	3/4	3/10	10,000	*7		
1897	34,356,000	3/1	3/7	13,625	*8		
1898	38,923,000	3/1	3/7	15,000	*9		
1899	48,494,353	2/11	3 5	20,000	*10	3000	*7
1900	61,219,736	2/10	3,6	20,000	10	5000	7
1901	74,185,215	2/10	3 4	20,000	10	8000	7
1902	81,705,608	2/10	3 3	20,000	*10	8000	*7
1903 (Half Year.)	40,094,120	2/10	3,1	20,000	*10 10/-	8000	*7/7/-

a. Engines. *b.* Ordinary. *Free of Income-Tax.

IT WILL be observed from the foregoing table that during the Ten Years the Company has carried on Business, the Sale of Gas has increased from 17,104,000 to 81,705,608 cubic feet, the prices charged for Gas have been reduced from 3s. 6d. and 4s. to 2s. 10d. and 3s. 1d. per 1000 cubic feet, and the dividends paid have increased from £5 per centum to £10 10s. per centum on the original capital. It will also be observed that the Dividend paid last half year on the additional capital was Seven Shillings per centum above the authorized Standard Rate of Dividend.

The rapid progress of the Company has necessitated large capital expenditure, and it is to provide for this expenditure that the Additional Stock is now being issued.

The Directors have recently expended upwards of £4000 in the construction of a Water-Gas Plant. This Plant is now in working order, and it is confidently anticipated that in the future such a saving will be effected in the cost of materials for the manufacture of Gas, that a further considerable reduction can be made in the prices charged to consumers, and that this will be followed by increased sales and consequent increased prosperity to the Company.

The £8000 of Additional Stock already sold has realized an average price of £15 7s. 5d. per £10 nominal value.

Forms of Tender, with Particulars as to making the same, may be obtained on application to the Secretary.

Applications will not be entertained for less than Ten Pounds nominal value of Stock, or for more than One Hundred Pounds in One Tender; but any number of separate Tenders may be made by the same person.

A copy of the Rushden and Higham Ferrers District Gas Act, 1899, can be seen at the Secretary's Office.

GEO. S. MASON,
Secretary.

Secretary's Office,
135, High Street, Rushden.

Last day for Tenders to be received Nov. 27, 1903.

BRIDGEWATER COLLIERIES COKE-WORKS.

(THE EARL OF ELLESMERE).

TENDERS are invited for the Tar produced at the above Works for a period of Six or Twelve Months from the 1st of January, 1904, delivered into contractor's tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley siding on the Little Hulton Mineral Branch of the London and North-Western Railway.

The estimated quantity is 2500 Tons per annum.

Tenders, endorsed "Tender for Tar," to be addressed to Mr. THOMAS M. BROWN, Bridgewater Coal Office, 4, Chapel Walks, Manchester, on or before the 7th of December.

LEATHERHEAD AND DISTRICT WATER-WORKS COMPANY.

NOTICE is Hereby Given of Sale by TENDER of 400 SHARES of £10 each (with dividend thereon limited to 7 per cent.), being a portion of Additional Capital authorized to be raised by a Resolution passed at the General Meeting of Proprietors, held on the 29th of October, 1903, in pursuance of the Powers of the Leatherhead and District Water Order, 1903.

No Tender will be received after Eleven a.m. on Friday, Nov. 27, 1903, nor below £13 per Share; and notice of acceptance will be given on Tuesday, Dec. 1, 1903.

Form of Tender can be obtained on application to the Secretary.

By order,
JOHN YOUNG,
Secretary.

North Street, Leatherhead,
Nov. 12, 1903.

CROYDON COMMERCIAL GAS AND COKE COMPANY.

SALE BY TENDER OF £5000 CONSOLIDATED "C" ORDINARY STOCK.

MINIMUM PRICE OF ISSUE, £180 PER £100 OF THE STOCK.

THE Directors invite Tenders, at or before 10 a.m. on Wednesday, the 2nd of December, 1903, for the above.

The Dividend on the Stock is payable half yearly, in February and August of each year.

The Dividends for the 18 half years to December, 1902, were at the rate of 9 per cent. per annum, the last nine being paid free of Income-Tax; and for the half year ended June, 1903, at the rate of 9½ per cent. per annum, less Income-Tax.

The net profit earned during the year ended the 30th of June, 1903 (after deducting all charges, including £1560 8s. 4d. interest on Loan Capital) amounted to	£34,458 14 2
This profit was arrived at after carrying to Reserve Fund the sum of	1,500 0 0
And during the same year the Interest on Investments (carried to the credit of the Reserve and Insurance Funds) amounted to	1,091 9 4
	£37,050 3 6

The Reserve and Insurance Funds amounted on the 30th of June, 1903, to £43,639; and the Investments of these Funds (principally in Consols) were valued at £37,894.

Forms of Tender, with Particulars and Conditions can be obtained from the undersigned.

WILLIAM W. TOPLEY,
Secretary.

Offices of the Company:
Katharine Street, Croydon.

THE BRISTOL GAS COMPANY.

IMPORTANT ISSUE OF
GENERAL CAPITAL STOCK
AND
NEW DEBENTURE STOCK.

GEO. NICHOLS, HOWES, YOUNG, ALDER, and CO. are instructed to SELL by PUBLIC AUCTION, at their SALE-ROOM, 49, BROAD STREET, Bristol, on Thursday, the 10th day of December, 1903, at Half-past Two p.m. precisely,

IN LOTS OF £100 EACH, OR LESS,

£15,000

FIVE PER CENT. MAXIMUM
GENERAL CAPITAL STOCK
AND
£5000
NEW DEBENTURE STOCK
(Bearing

INTEREST AT THE RATE OF FOUR POUNDS PER CENTUM PER ANNUM, payable Half Yearly in June and December),

OF AND IN

THE BRISTOL GAS COMPANY,

Issued by the Company under their Statutory Powers.

The Stock will be Sold and Registered in the Books of the Company *FREE OF EVERY EXPENSE* to Purchasers thereof.

Full Particulars and Conditions of Sale may be obtained of the AUCTIONEERS, 49, Broad Street, Bristol; Messrs. BRITTAN, LIVETT, AND MILLER, Solicitors, Albion Chambers, Bristol; or of

JOHN PHILLIPS,
Secretary.

Chief Office, Canons' Marsh, Bristol.

TENDERS WANTED FOR THE ERECTION OF NEW GAS-WORKS.

TO BUILDERS, CONTRACTORS FOR GAS-WORKS, AND OTHERS.

TENDERS are invited by the Urban District Council of Strabane for the erection of a GAS-WORKS in accordance with Specifications, Schedules, and Drawings, which may be seen either here or at the Offices of Mr. Charles Hunt, M.Inst.C.E., 15, Victoria Street, Westminster, S.W., from whom also Copies may be obtained on payment of Three Guineas, to defray the cost of same.

Sealed Tenders, which may be for the whole or any part as divided in the Specifications, endorsed "Tender for Gas-Works," and addressed to The Chairman, Urban District Council, Town Hall, Strabane, to be sent in not later than Tuesday, the 15th day of December next.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
T. B. Feely,
Town Clerk.

Offices: Town Hall, Strabane,
Nov. 7, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. Alfred Richards' Offices, 18, Finsbury Circus, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 300 £10 "C" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 8, at Two o'clock precisely, in Lots.

Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £4570 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 8, at Two o'clock, in Lots.

Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

CASES FOR BINDING
QUARTERLY
VOLUMES OF THE "JOURNAL"
(Green Cloth, Gilt Lettered)

A 4pp. 8vo. Leaflet. Price, 10s. 6d. per 100.

"Agricultural Value of Gas Lime."

A Paper read by Mr. CHARLES D. PHILLIPS, J.P., a Director of the Newport Gas Company, before the Monmouthshire Chamber of Agriculture.

Reprinted from e "Journal" for Oct. 13, 1903.

Walter King, 11, Bolt Court, Fleet Street, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY
RAVENSTHORPE, NEAR DEWSBURY.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.

THE
PETROLEUM GAS SYNDICATE
Supply and erect Complete Installations of their
PETROGENE PATENT GAS PLANT
On SALE, HIRE, or ROYALTY.

PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.

The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.

Offices: **28, Victoria St., Westminster.**
Works: **10, Rochester Row, S.W.**

THE
"ROTARY"
STATION METER.

Efficiency
Demonstrated.

APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

WEST HAM GAS COMPANY,

Established 1845; Incorporated by Special Act of Parliament 1856; further Parliamentary Powers being obtained in 1869, 1889, and 1902; this Company supplying the Borough of West Ham (including Stratford, Forest Gate, and Plaistow), the Districts of East Ham, Leyton, Leytonstone, Snaresbrook, Wanstead, and part of Woodford.

SALE BY TENDER OF £85,000
FIVE PER CENT. PREFERENCE STOCK,

Created by Resolution of the Extraordinary General Meeting of the Proprietors of the Company, held August 11th, 1903, under the Powers of the West Ham Gas Act, 1902, being part of £250,000 authorized by that Act; such Preference Stock ranking for Dividend after the Debenture Interest and before the Consolidated Ordinary Stock of the Company.

MINIMUM PRICE £110 PER CENT.,
At which Price the Stock will pay £4 10s. 10d. per Cent.

10 per Cent. payable on application; 25 per Cent. payable on Dec. 1st, 1903, and the Balance payable on Jan. 1st, 1904.

PARR'S BANK, LIMITED, are authorized by the Directors to invite TENDERS for £85,000 Five Per Cent. Preference Stock, in accordance with the conditions and upon the form annexed to the Prospectus. Dividends will be paid on March 1 and September 1 in each year, for the half years ending December 31 and June 30 respectively. On the 1st March next, one month's Dividend will be payable on the amount paid up by 1st December, 1903, and the first full Dividend will be payable on the 1st September next, being for the half year ending 30th June, 1904.

This additional Capital is required in order to meet the increasing business of the Company, and in particular the cost of Plant at the new Auxiliary Station at East Ham and of Prepayment Installations. The demand for the latter has been unceasing since the Company adopted the Automatic Meter System towards the end of last year; since which time upwards of **5000 of these Installations** have been put into operation, and some **3000** further applications for them have been received.

The **Capital** of the WestHam Gas Company consists of the following—viz.:

Perpetual 4 per cent. Debenture Stock	£160,000
Consolidated Ordinary Stock	745,872
Premiums on Sales of Stock (used in the business, but carrying no dividends)	65,189
Total	£971,061

The Standard Dividend on the Consolidated Ordinary Stock—Gas being at 2s. 11d. per 1000 cubic feet (its present price)—is 5 per cent. per annum, and Dividends at that rate were paid for the half year to 30th June last, £3041 18s. 3d. being carried forward; the Statutory Dividends upon issued Capital having also been regularly paid since 1897.

The steady growth of the Company's business will be seen by the subjoined figures:—

Year.	Gas Made. Cubic Feet.	Net Profits. After payment of Debenture Interest.
1880	263,791,000	£18,552
1885	453,359,000	20,434
1890	627,134,000	20,049
1895	804,492,000	26,593
1900	1,107,840,000	32,301
1901	1,135,289,000	28,215
1902	1,153,442,000	34,382
Half Year to Midsummer.		
1903	**585,096,000**	**20,091**

The dividend on this issue of £85,000 amounts to £4250—an eighth part only of the net profit of last year.

The ordinary customers number at the present time	18,212
The prepayment do. do. do.	5581
Total	23,793

There are also 3539 public lamps in the district lighted by gas, and 6898 gas cooking-ranges and fires let by the Company on hire to ordinary consumers.

The Company's **Reserve and Insurance Funds** amount to £27,919
(Invested in £27,563 5s. 5d. India 3 per cent. Stock).

Of the Preference Stock, now offered, amounts of £10, or any multiple of £10, may be tendered for.

The minimum price (below which no Tender can be entertained) has been fixed at the rate of £110 sterling for each One Hundred Pounds of Preference Stock.

A deposit of £10 per cent. of the (nominal) amount of stock tendered for must accompany each Tender.

A further 25 per cent. will be payable 1st December next, and the balance of the Purchase Money on January 1, 1904. Purchasers may pay up in full on 1st December next; in which case they will be entitled to Dividend from that date.

Tenders should be made upon the printed Form attached to the Prospectus, and must be lodged at Parr's Bank, Limited, Bartholomew Lane, London, E.C., not later than Twelve o'clock (noon) on Thursday, November 19th, 1903.

For further details see the "Conditions of Tender."

Application for a Quotation of this Preference Stock will be made in due course to the Stock Exchange.

Any additional Information may be obtained from the Secretary.

By order of the Directors,
A. G. SNELGROVE,
Secretary.

West Ham Gas Offices,
Stratford, London, E.,
Nov. 3, 1903.

Copies of the complete Prospectus (with Conditions of Tender, &c.) can be obtained from Parr's Bank, Limited, Bartholomew Lane, London, E.C., and Branches; from the Company's Brokers, Messrs. Sheppards, Pellys, Scott, & Co., 57, Old Broad Street, E.C.; or from the Secretary, West Ham Gas Company, Stratford, E.

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD STREET, E.C.

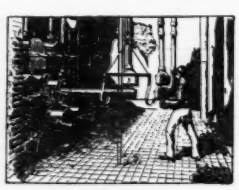
THE PERFECT MANTLE CO$^{Y.}$
1c, Aldgate Avenue, London, E.C.

MANUFACTURERS OF THE WELL-KNOWN
SUPERIOR "PERMCO"
MANTLE, IN COTTON AND RAMIE.

Under Welsbach Licence. Can be used legally with any Burner.
Trade Price 26s. 6d. per Gross.
Reduction for Quantities.

ATTERTON'S
CHARGING APPARATUS

Nearly **40** of these Machines have been



supplied to English Gas-Works.

Sole Agents for the United Kingdom:
E. PADFIELD & CO.,
96 & 98, LEADENHALL STREET, E.C.
Representatives:
Messrs. BELL & CO., Engineers, CARDIFF,
Mr. J. B. MACDERMOTT, GLASGOW, and
J. BYRON MACKENNA, DUBLIN.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

FISCAL POLICY.

Taxation of Labour-Saving Machinery.

A Correspondent recently drew Mr. CHAMBERLAIN's attention to labour-saving machines having thrown numbers of people out of employment, as for instance, Whitewashing and Painting Machines. This Machine met the requirements of the Factory Act, and its introduction had been instrumental in depriving men of their work. The correspondent contended that machines of this kind should be looked upon much in the same way as our Australian Colonies regard the Chinese immigrants, upon whom they impose a poll tax of £100.

Mr. CHAMBERLAIN replies, through his Secretary, "that he does not think it would be practicable or desirable in the interests of the working classes to discourage the use of self-acting machinery."—*Extract from the Westminster Gazette.*

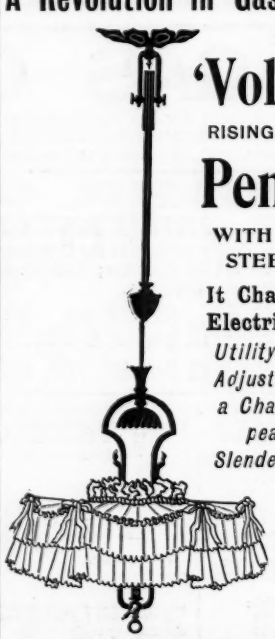
The fact is that this machine is of the greatest benefit to the employers as well as to the working classes, and you *cannot do without it.*

Full Particulars on application to the—

EVERTRUSTY PAINTING AND WHITE-WASHING MACHINE CO.,
57, GRACECHURCH ST., LONDON, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

A Revolution in Gas-Fittings



IS THE
'Volonta'
RISING & FALLING
Pendant
WITH FLEXIBLE STEEL TUBES.
It Challenges the Electric Light for *Utility, Novelty, & Adjustability, and a Charming Appearance of Slender Elegance.*

Patented in many Countries.

Sole Patentees and Manufacturers:
EDWARD J. SHAW & CO, WALSALL.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
With Elevators and Conveyors worked by Steam or Gas Engine.
GEORGE WALLER & SON,
165, QUEEN VICTORIA STREET, E.C.;
And at STROUD, GLOUCESTERSHIRE.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
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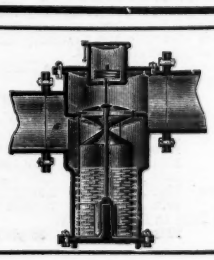

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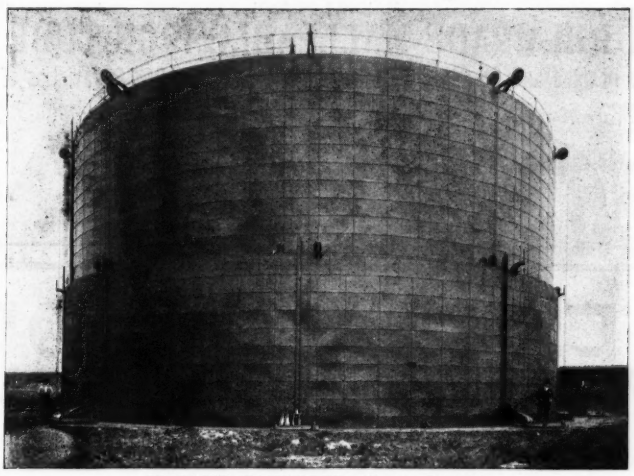

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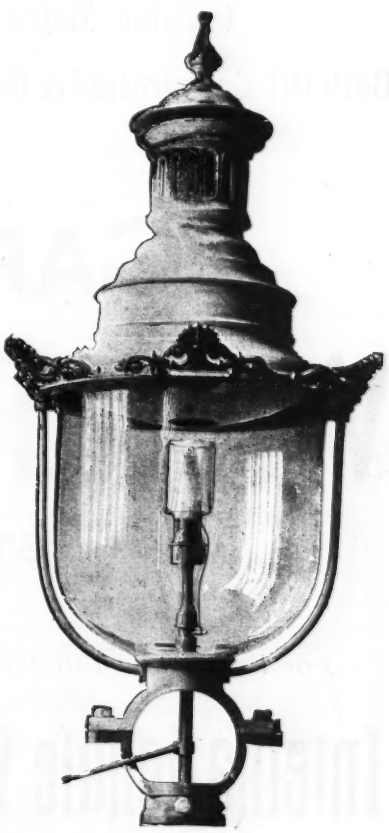

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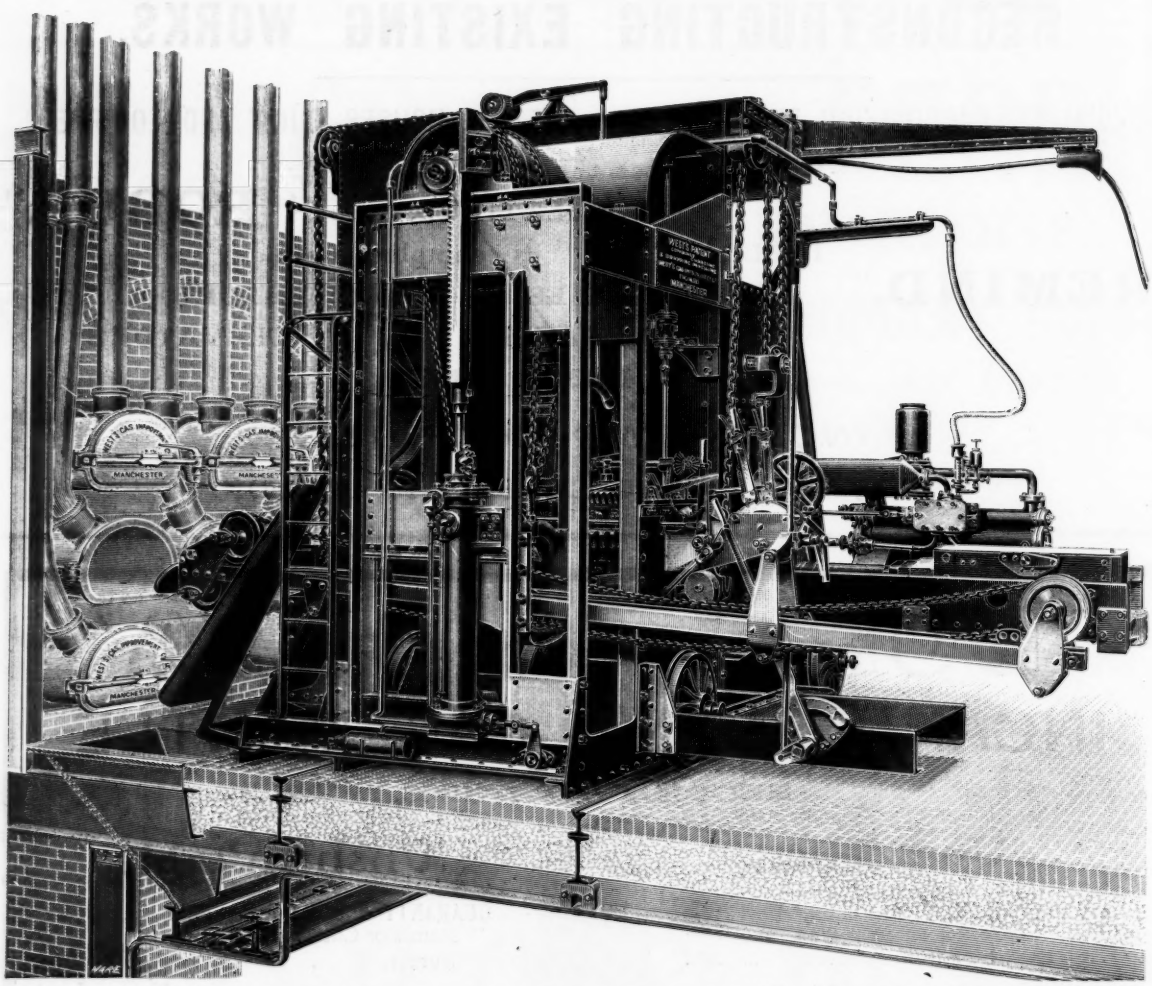

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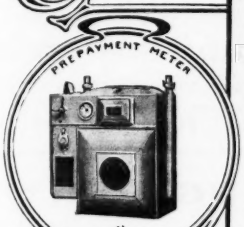

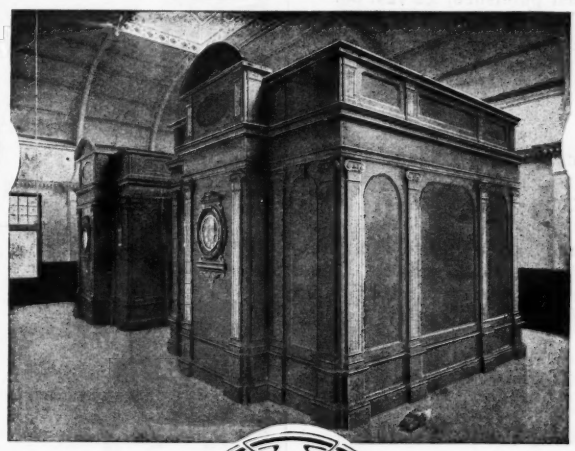

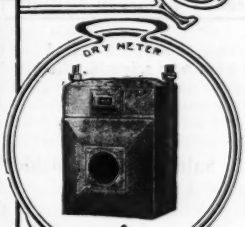

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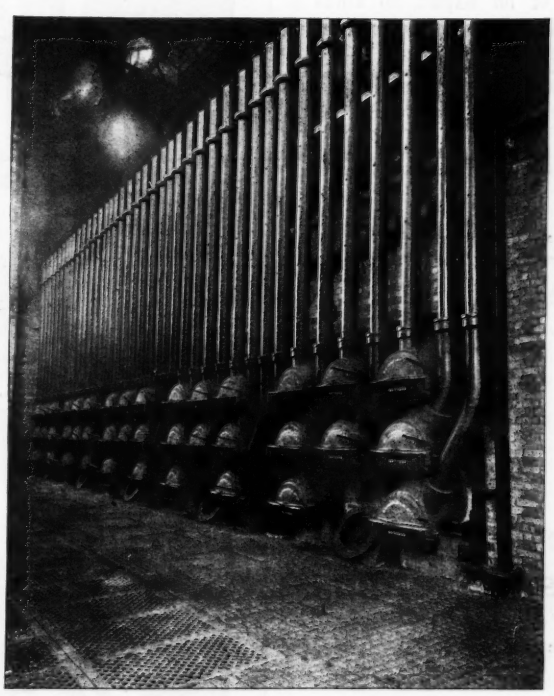

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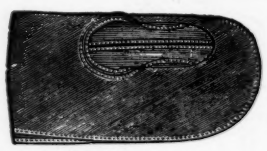

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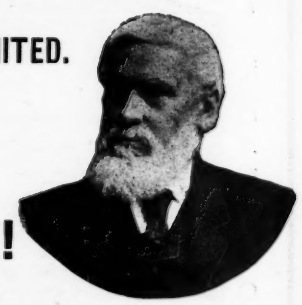
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